History of QRP in the U.S., 1924-1960

Adrian Weiss
WORSP

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DEDICATION

This book is dedicated to those:
-- who have shared their experience and knowledge with others
-- who have led, like Kruse, Hatry, Schnell, Handy and Battey
-- numberless QRP'rs who have endured against the odds
-- unsung heroes, the receiving operators, who make QRP possible

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in the

U.S., 1924-1960

Adrian Weiss
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Milliwatt Books
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Contents

1. The K8EEG Story 1
A Visit from The Old Man 19

2. Prologue to Exploration: The Unknowns 22
I. From Spark to C.W. - The Vacuum Tube 22
II. Exploring Unknown Territory: The Shortwaves 27
III. From Flat-tops and Counterpoises to Antennas 34

3. QRP Pioneers on the Frontier, 1923-24 39
I. The New American Amateur and QRP 40
II. Kruse Launches the QRP Movement 42
III. QRP Exploits in 1924: U.S. Amateurs Outdone 44
IV. American QRP'rs Enter the Battle 47
V. The Emergence of the QRP Operator 49

4. 1925: QRP Takes the Spotlight 55
I. Exploring 40 and 20 Meters 55
II. QRP Records and the Jewell QRP Contest 57
III. QST's 'Special QRP Issue' 63
IV. Col. Foster (c9CK): 'A Man and His Hobby' 66

5. 1926-27: Newcomers and DX'rs 72
I. QRP Features and Experiments in Radio Broadcast 73
II. Finally - Windom (8GZ) Brings a Record Home 79
III. Of, By and For the Beginner 82
IV. Exiled to Foreign Parts-IARU Reports 86

6. 1930-1941: Grassroots vs. High Power QRM 96

7. QRP Gains Ground: 1930's 108
I. Without Fanfares: The Low Power Work Goes on 108
II. QRP's Few Brief Moments on Stage 111
III. Flea Power Transmitters and the Thrills of QRP 119

8. The QRPr's Story: In Their Own Words 128
I. Sutter's 'Portable Five' 128
II. Brief QRP Operating Reports 130
III. Flea Power in the Artic 132
IV. Pecos River QRPp - Circa 1934 135
V. Perfect Summer Plus QRPp 138

9. The Uprising of '37: The 'Flea Power Association' 143

10. 1945-1960: Before the Transistor 152
I. A Few QRP Triumphs, Mostly Routine QRP 152
II. QRP Transmitters and Testimonials 155
III. QRP'rs in KW Country 163
IV. How's [QRP] DX? 167

11. 1954-1960: Milliwatts and Miles 178
Epilogue 188

Preface

My own history as a radio amateur carried within it the seeds for the writing of this book -- "The K8EEG Story" makes that obvious. But that doesn't explain why there is a book after all. That's another story. During all those years in which I plied the ham bands with QRP, I did not know that I was a QRP'r. I thought I was just another garden variety ham who happened to like low power transmitters (or couldn't afford better), and got satisfaction from building and making contacts with them. Then something happened to change that when I opened up a sample copy of Mike Czuhajewski's (WA8MCQ) "QRP/8" newsletter that arrived in 1968 as part of a mailing to all '8' district members of the 100-watt QRP Club International members. As I glanced through the dittoed contents, I experienced the stunning revelation that others were out there who battled away at the QRM and odds with low powered transmitters. For the first time, I realized that I belonged to something in amateur radio! Prior to that, I never really belonged to any recognizable group -- they had 'real' equipment like high power, store-boughten rigs and exotic antennas and were 'real' hams. I never saw a picture in the ham magazines of anything that looked like my 'station'. I was merely a 'make-shift, make-do' ham who didn't have the goods to belong with DX'rs and County Hunters and other groups of real hams -- until "QRPp Corner" and the QRPp news in "QRP/8" showed me my place! I was so excited that I immediately fired off a letter to WA8MCQ offering to submit a little article about my 'pride and joy' of the moment, a two-stage transistor transmitter with a transistor v.f.o. -- it wasn't much, but I wanted to share it with my particular breed of radio amateurs! That desire has kept me writing about QRP all these years.

But there is something essentially different about this *History of QRP* that separates it from the rest of my writing. We all know by now that we belong to a recognizable group of radio amateurs because of the growth of QRP in the last decade or so. But most of the new QRP gang doesn't realize the whole story. What I want to give QRP'rs in this book is a new sense of identity -- a sense of belonging to a tradition in amateur radio that stretches right back to the very beginning, a tradition which, in fact, is rooted in the highest ideals of American amateur radio.

The genesis of *History of QRP in the U.S., 1924-1960* merits comment. This book is an expansion of the history section of *The QRP'rs Guide to Transmission Lines, Antennas, Propagation and DX'ing: The History, Theory and Practice of QRP*; another section has already been published as *The Joy of QRP: Strategy for Success*, and the section about antennas, propagation and DX'ing will be forthcoming by 1989 if all goes well. I began *The History of QRP* because I was originally curious about what the early QRP'rs did in the way of conquering distance with low power, knowledge and skill. I did not expect to uncover the wealth of material that emerged.

The original history section of *The QRP'rs Guide* had been completed several years ago with the focus entirely on the exploits of early QRP'rs until 1927. When I began preparation for publication recently, I had the time to look beyond that original cutoff date, first working with the 1945-60 period. I found a marked difference in the manner in which low power work was presented in the later period. The presentation of the QRP'r as the antidote to the 'watt-hog, ether-buster', a constant feature of editorial treatment in the 1920's, was entirely absent. That contrast brought into focus the theme underlying the role of QRP in American amateur radio. The materials of the 1930's were then researched with the objective of determining if and when an actual shift had occurred in the role of QRP.

From that research emerged a continuous tradition in the presentation of QRP stretching from Warner, Kruse and Hatry through Schnell and then Handy and Battey. Its central theme was the antithesis between the low power operator

and his association with the concept of Kruse's New American Amateur, and the QRM-generating high power operator. Any reference to the one automatically implied the existence of the antithetical partner. In a sense, QRP was a distinct element of amateur radio in the early days primarily because many American amateurs inconsiderately exceeded the regulatory qualification on the 1000-watt power limit by using powers far in excess of what was needed to maintain communication. In other words, without the 'watt-hogs', there would have been no QRP'rs. Until about 1937, the exploits of the low power operator (and hence the use of low power itself) provided the *prima facie* evidence in the case against the abuse of the American power limit and the destructive influence that it exerted on American amateur radio. After that point, the ARRL ignored the issue and QRP lost its previous pivotal role in American amateur radio. This shift seems to coincide with the maturation of the ARRL from a 'club' with a flexible, direct connection to its membership through *QST*, to an 'organization' with a Board of Directors deciding a policy that precluded any official response to criticisms which might antagonize a portion of the membership. At about the same time, an official headquarters was erected, and by 1939, *QST* had 'gone slick' with an editorial format which endured almost unchanged until the present. Any reference to the use of excessive power was and is done in the most diplomatic, polite and deferential terms imaginable, if at all. And so, without the battle against its arch-enemy the 'watt- hog', QRP languished into a nebulous oblivion, lacking the publicity it had previously received.

The approach followed in this book can be characterized as "popular history" in the tradition of Eileen Powers' *Medieval People* and other books like it. Such a history combines the historian's presentation of facts and interpretation with original source materials for the reader's own perusal and interpretation. In keeping with my scholarly training as a literary historian, I have attempted to thoroughly research the available historical materials and honestly describe and interpret the facts and ideas found therein. However, the *History of QRP* is not directed at a scholarly audience, but to others like myself who want to enjoy QRP both in operating with low power and learning more about it. My objective was to write a book that I would enjoy reading for years to come, and so far, I still enjoy it despite the tedious tasks associated with publication. I sincerely hope that it will provide many hours of enjoyment, and hopefully valuable inspiration, to its readers.

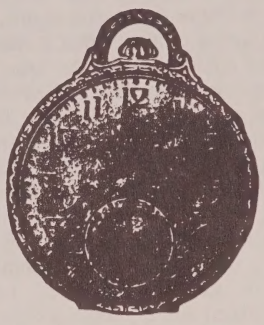
In closing, I want to recognize my debt to those who contributed to this book in various ways. Associate Professor Sylvia Wheeler of the University of South Dakota kindly provided helpful comments about Chapter 1 for which I am grateful. I am especially indebted to the Editor of *QST* for permission to quote extensively from that journal, to reprint several entire articles, and reproduce numerous photos. Without this generosity, the *History of QRP* would indeed be a slim volume! Similarly, I am grateful to the Editor of *CQ* magazine for permission to quote materials and reproduce photos. And I wish to express special thanks to Robert Curtis, W1EXZ, for copies of his original logs and notes as well as his comments regarding 'The Flea Power Association'. Finally, we are all indebted to those many QRP'rs who took the time to write their stories for publication and thus provided modern QRP'rs with a sense of their place in a tradition which stretches back to the beginning!

A history such as this is never completed as long as more historical material is available. Please submit anything of potential interest to the author.

Adrian Weiss
W0RSP (ex-K8EEG)
August 10, 1987

The Full-page Announcement of the Jewell 1926 Radio Contest *(see page 60)*

"MORE MILES PER WATT"



A 21-jewel watch with a solid white gold hand engraved case and a Lord Elgin movement has been selected as the 1926 Jewell trophy for advanced work in radio. This trophy will be awarded on June 1, 1926, to that amateur operator licensed by the United States or Canadian Governments who has submitted documentary proof of having transmitted, by wireless telegraphy, the most miles per watt over a distance of 300 miles or more.

JEWELL

1926 Radio Contest

For

Amateur Operators Licensed by U. S. and Canadian Governments

This contest was first announced at the Third National A.R.R.L Convention held in Chicago in August. It is being held in the interests of efficiency of operation and efficiency in the last analysis is the goal of the amateur.

DX records in the future will probably make careful mention of power input in order to establish a miles per watt basis for discussion.

Miles per watt is an excellent criterion of station efficiency and enables credit to be given to the small station which is operated in accordance with the best engineering principles. It allows such a station to compete on a favorable basis with the more powerful stations, which may reach further by sheer power.

And to measure the input Jewell instruments continue to be found the mose reliable, accurate and dependable instruments for the amateur. They are especially adapted to his needs and will prove a necessity for the well-equipped transmitter.

Send for Printed Rules Governing This Contest

Jewell Electrical Instrument Co.

1650 WALNUT STREET

CHICAGO

"MORE MILES PER WATT"

Chapter 1
The K8EEG Story
and
A Visit From the Old Man

Anyone who is interested enough in radio to pick up this book and begin reading about QRP operation probably has already felt the fascination which makes QRP operation so rewarding to a rapidly increasing number of radio amateurs around the world. We are drawn to radio in the first place because it enables us to communicate across vast distances with other people whom we will never meet face to face. Amateur radio's very essence is the act of communication and it appeals to an inherent need in the social animal that Man is. And the beginning is the most exciting period in the experience of radio amateurs. That is, when the fascination with radio is felt in its purest form, still fresh and untried, full of unknowns and surprises. Regardless of our age, we feel like children who are confronted with a 'magic' that can perform wonders beyond their ability to understand or explain. It is a magic that seems supernatural, and that type of phenomenon captivates the human imagination. We find it difficult to believe that we are actually hearing someone thousands of miles away speaking to us in a wavery voice or in fluttery code signals. The magic is evidenced only in the eerie sounds coming from the phones or speaker, sounds which are unlike others we hear in our environment, but which are manmade nonetheless. Like the Siren's Song, they call to something deep in human nature, and many of us respond by sitting intently before the receiver for hours on end, trying to fathom the mystery of radio, feeling the desire to reach out and talk back. That desire to communicate is what leads us to acquire the Novice license.

For most of us, the big moment came when months of study, code practice, and building placed us in front of the equipment with which we hoped to talk back to the sounds coming through the speaker. We felt like the early pioneers who first demonstrated that long distance communication via the ionosphere was possible, like the early trail blazers who moved ever higher in frequency, always wondering whether or not they would make contact. We reached for the key those first times with the same intense anxiety, our minds focused intently upon the flight of the invisible radio signal from our antenna and out into the endless reaches of space, wondering, "will it work, will I be heard?" We held our breath through the slow milliseconds separating our first 'go ahead' from the hoped for response, and when the response came, there was that feeling of elation and the explosion of pent-up breath in the thrill of success. Most of us have felt this in our early radio experience. For many, the experience has lost its mystery because of the reliability of making contact with high power equipment. But many of us have rediscovered our beginnings again in operation with low power because we are confronted with the suspense, we always wonder "*Will he hear me?*" each time we reach for the key or mike. We frequently re-experience our first days and weeks as amateurs when operating QRP.

It hasn't been all that long since I went through such a re-experience of the early days. Sometimes I wonder whether other QRP nuts get carried away like I do. I suppose that my behavior would appear rather strange to someone who has not felt the mystery of radio. An observer would see a grown man sitting in front of a radio in a dimly lighted room, bent intently over the keyer, slowly sending code signals, pausing, and then jumping in his chair as a signal comes back to him through the speaker, exclaiming something like "*Wow, he's coming back to me, he heard me. Fantastic!*" That still happens to me, and I've been working the world

with low power for over a quarter of a century. Many contacts make me forget that I'm an adult, and I spontaneously react just like the kid I was back in the mountains of southwestern Pennsylvania in my early days. I don't know how many other low power fanatics behave like that, but I'd be willing to bet that many of them do, judging from their excitement in telling me about special contacts weeks after they occurred. We all encounter these special contacts when operating with low power. That is why the typical QRP operator takes over eyeball conversations at club meetings with enthusiastic, highly detailed narratives of his latest QRP exploits. In looking back over the last decade, I can remember many such contacts. The amazing thing is that I can actually recall them in detail, sometimes even remembering the sounds and propagation effects.

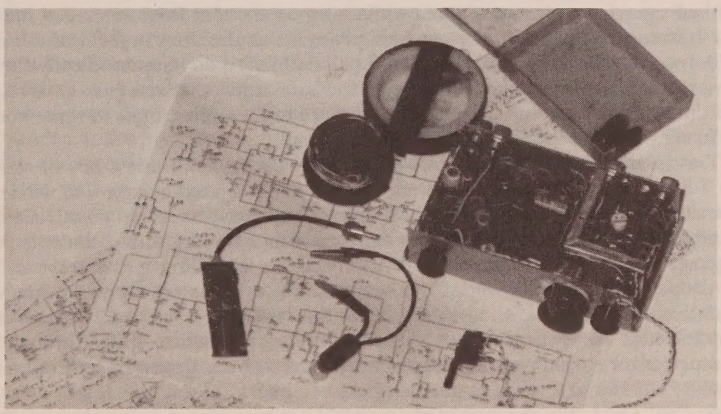
I remember my first solid-state DX contact back in 1971 and how it amazed me, even though I knew it was entirely possible both from theory and my early experience with low power back in the sunspot peak of the late 1950's. I was using homebrew solid-state gear. The direct conversion receiver had grown from a simple oscillator, mixer and audio amplifier into an all-band unit with a three-stage active audio filter and IC audio amplifier driving a speaker. It was housed in a homebrew cabinet made from duct material, and painted a black- crackle finish. It was a good receiver, for what it was. The transmitter used a 2N2102 in the final for about 700 milliwatts output on 20 meters. I had just finished work on a homebrew yagi constructed from bamboo poles wrapped in aluminum foil for elements (see *CQ Magazine,* June, 1976), with a T.V. mast boom and rotator. It was a beautiful antenna, and later I described it as a prehistoric eagle alighting on a slender pole. I had built the yagi to get the edge I felt I needed to span the oceans, but I didn't expect results so soon. As I sat in the cold basement shack that morning, I found it hard to believe that the UA1 was responding with my familiar 'K8EEG', and that we continued for 20 minutes, experiencing difficulty at both ends, but completing the contact. There I was, communicating across some 6000 miles of ocean and land, using homebrew equipment and only 700 milliwatts output! Not only was it possible, I was doing it! The excitement of my first days as a Novice came back to me during that contact. I became obsessed with working DX again.

A couple years later, I had an experience that stands out from all the rest. By this time, I had built more sophisticated equipment and had increased my output to 4 watts. One evening in April, 1973, right at the bottom of the sunspot cycle, I was tuning around an otherwise dead 20 meter c.w. band and came across a pileup with ZM2AFZ as the focus of attention. Even though all the indicators suggested that I didn't have a snowball's chance of working him, I gave him a quick 3x3 call when he signed, and believe it or not, he came back to me, explaining that I had the best signal of the dozen or so west coast stations calling him. I routinely informed him of my power, and then the contact became a very unique experience. He 'broke' me and requested verification of the 4-watt power, which I gave, and he then proceeded to become excited, indicating his disbelief that such low power could be pounding into New Zealand with such strength. Meanwhile, the rest of the pack waited and listened to his exclamations about QRP and my signal strength. After about 15 minutes of rapid exchanges, he suggested that we move up into the DX phone band, and he'd record my signal and play it back to me so I too would believe its strength. So we QSY'd and he played the tape. *WOW!* There's no way of describing it. There I was, sitting in South Dakota with my QRP rig, and I was hearing a recording made in New Zealand, and my signal was literally rocking the very foundations of his shack! His recording mike was at some distance from the speaker -- he positioned it deliberately so that I would get the full effect of the phenomenon -- and the reverberation and strength was simply incredible. I never really believed a 599 report before that

experience, but I do now. I sat there grinning and 'wowing' as he played back every transmission for the next half- hour or so until we had both drunk deeply of the mystery that we confronted. It was a very strange experience in which the past mingled with the present moment, when all the magic seemed to engulf my consciousness as I sat listening to the playback. In my early days, I was always fascinated by listening to an incoming signal and trying to imagine the person who was sending it, the details of his shack, the topography of his location. This time, I was the person sending it, I was where it was coming from across a 20,000 mile journey. The signals always come from another like myself, fascinated with the magic of radio that allows me to communicate with other human beings, curious, excited, surprised that I can reach out into all the corners of the earth, and make contact with another person.

For some reason, I find that low power operation always provides its greatest thrill when it duplicates the experiences of my early days; back then, I used homebrew transmitting gear, simple antennas, and often times makeshift operating situations. It seems somewhat strange to me that, after designing and constructing many different receivers, transmitters, and transceivers, I still develop such an intense affection for each new unit which is plugged into the antenna and used to make contacts. I suppose it has something to do with the suspense of the early days and the question of whether or not the thing will work. When it does, it becomes intertwined with the success of my first rig, and the same exhilaration is present. I remember a particular instance. I'd designed and built my *Viking 3x5* (see *CQ,* May, August, 1980) for my personal use, and had not intended to publish an article about it because of the complexity of the project. The '3x5' was the culmination of many years of dreaming about the ultimate portable transceiver and what it would do. My first contacts with it confirmed my hopes that I'd put the dream into reality, and operating with the '3x5' brought new vigor into my operating. But, to get to the story.

Viking 3x5 Transceiver. *The '3x5' sits atop the schematic. Measuring 3" x 5", the unit is capable of 5 watts output on 20 meters, v.f.o. controlled. The shielded upper right corner contains the transmitter circuit (2N5589 final), with remaining space filled by the receiver p.c. board. To the front are the microswitch key, 12v antenna current indicator bulb, and L- network. The reel carries 66ft antenna and monofil.*



I took the *Viking 3x5* along on my motorcycle camping trip during the summer of 1979 on the outside chance that I'd be able to operate from different locations in a portable situation. Naturally, a potential campsite was ranked according to

the antenna supports it offered in the form of tall trees. I pitched my tent in Iowa beside a large lake with an hour to spare before the clouds that had followed me all day began to drench the landscape. It wasn't very comfortable lying on my stomach in the small puptent floor and supporting myself on my elbows, just like I did when I first started out in radio. It was difficult to hold the single earphone with one hand and tune the transceiver with the other, or to hold the microswitch which I used as a keyer with the fingertips of my left hand, while trying to send intelligible code with my right hand. But I had many excellent contacts all over the U.S. using the 66ft wire strung between two trees. In fact, during the several hours each day spent in the tent to escape the rain, I don't recall failing to QSO anyone I called. I wasn't hearing much DX, but one afternoon, I did manage to pull a weak UA1 out of the noise and gave him a call -- just in case. Damn if he didn't come back with a 559 and copy me solid for our 15 minute contact. I couldn't quite believe it. There I was, out in a tent by a lake, with no a.c. power lines in sight, nothing for an antenna but a 66ft piece of Nr.28 wire slung between a couple trees, and I was talking to a fellow ham in Russia.

After the contact, I went outside in a state of amazement and walked up a little rise from which I could line up my tent with Russia. I sat there, puffing on my pipe in vacation leisure, looking along an imaginary line through my tent to the distant location of Russia, trying to grasp the enormity of the distance, the mountains and oceans between us. It made the place, the tent, the antenna, and me all seem very small, even minuscle, in a vast world. It made me feel that sense of awe at the magic of radio, a magic which made it possible for a man occupying a small speck of land to reach across distances which are difficult to visualize imaginatively and communicate with another such as myself, with a distant stranger who in all probability sits there in a foreign land and looks toward me across frozen tundra or whatever is there. Even though our respective political leaders have decided that we are enemies and consequently stockpiled sufficient nuclear weaponry to annihilate us both, we can outflank the politicians and wish each other well on a personal basis because of the magic of radio.

In sitting there and thinking about this, I was reminded of how, in my early days, I was impressed with the fact that I listened to news reports and commentaries on Radio Moscow and wondered how those Russians could be as bad as our U.S. propaganda of the time said they were. Perhaps the fact that I had just finished speaking with one of them while lying on the tent floor reminded me of how I listened to them in my early days, prostrate on the floor in front of the old RCA receiver. Since I was on vacation, I had nothing to do but periodically check my unsuccessful fishing line, operate in the rain, and otherwise just sit around and think things over and rummage in my store of memories. I got to remembering in considerable detail how it all started for me.

This fascination I have for radio started way back when I was a boy of about age 7-8 or thereabouts. My memories are of a dimly lighted living room with my dad sitting beside the old RCA table model shortwave receiver with Classical music fading in and out, and with an announcer interrupting with comments in a language which I did not understand. The darkness and warmth, the presence of my dad, and the eerie fading of the beautiful music made an impression on me which has never left me, and which, even at this late date, is evoked whenever my consciousness is focused upon the far-away world which spills through a loudspeaker or earphones. Since then, I have always been driven to seek out that far-away world and to revel in its mysteries.

At first, I was able to appropriate the RCA table model receiver when my dad purchased an elaborate Midwest hi-fi outfit from my uncle. This new receiver occupied the position of prominence in the living room, and although the shiny polished coppertone front panel was impressive, it lacked the warmth of the

wood cabinet of the RCA. I found the perfect spot for the RCA for my travels into far-away worlds. Between my parents' bed and dresser was a space just wide enough for me to lay in lengthwise, with the receiver on the floor against the back wall. It was like a little cave, and even in the daytime, the light was dim. I stretched a piece of copper wire about 20ft along from that corner of the house to a small tree about 8ft off the ground, and ran it into the receiver through a window next to the dresser. Seems I couldn't spend enough time huddled on the floor in front of the receiver, looking at the two green dial scale lines while listening. It was almost as if by looking long enough and hard enough at the two glowing green lines, I would be able to actually see where the sound was coming from out there, and of course, my imagination would take over and I would see far-away places in my mind and I would dream of them. I was in a constant state of amazement that I could hear a voice or music that was originating in a place thousands of miles away at that very instant.

One day, while waiting for my dad to buy cigars and a Sunday newspaper at the Westside News Store, I stumbled across a shortwave listener's magazine on the news stand and flipped through the pages, discovering lists of stations, with frequencies, times of broadcasting, programs, and with short articles on shortwave listening. Needless to say, I was overwhelmed with a wave of excitement and had to have that magazine. It became a focal point of my attention for weeks as I lay in front of the receiver, trying to correlate what I was hearing with the information the magazine provided. I would seek out stations listed in the log, but I rarely had success, since the RCA calibration left much to be desired. But every now and then, I'd find what I was looking for and I would be thrilled for days with the experience of tuning across the vast unknown spaces that the spectrum represented to me and finding something I recognized and knew from reading the magazine.

When I joined the Boy Scouts, another magazine became very influential in regard to my interest in radio -- *Boy's Life*. The Scout publication carried a shortwave listening column as well as sponsoring a big shortwave listening contest every winter. That was my first contest in radio, and it was exciting as well as frustrating. I would lay in front of the receiver with log sheet and pencil, waiting, sometimes a half-hour, for the station identification information which would allow me to log that station. Oftentimes the foreign language announcements would make no sense whatsoever, and I'd search the shortwave magazine log listings endlessly for some indication of what I was listening to. By the end of the month long contest period, I had managed to gather hardly more than two pages of entries, but I sent the log in anyhow, and months later I was delighted to see my score way down in the official results list -- not quite at the bottom. I was astounded at the high scores, and couldn't figure out how they managed. But they did it, and so could I, and I made up my mind to make it to the top next year.

That year was the important one. The Boy Scouts were most helpful. I acquired a straight-key c.w. buzzer practice unit from the troop, learned the code, and spent endless hours sitting on the floor next to a footstool, which served as a table, practicing the code. It took forever, but finally I had learned and could recognize all the characters when sent very slowly. Ed Krynock, the young Scoutmaster, would drill me with the 'dah di dah dah' routines whenever the chance arose. But as yet I could not practice copying on the air because the old RCA had no b.f.o. My grandmother had a really super shortwave receiver laying around unused, and it had a b.f.o. I had always dreamed of getting the old 1935 Silvertone, and, now that my interest in radio was firmly established in the minds of my parents, I finally cajoled everyone involved into letting me 'borrow' it. It was a beauty. The metal cabinet was finished in black crackle (I suppose because of the impression the old Silvertone made on me) and it had a large round dial about

eight inches in diameter, with about five separate dial lines of different colors (blue, yellow, green, and red) set in a black dial face. It had two dial pointers, one for the main tuning, and the other for band spreading. The b.f.o. had an adjustable frequency, and the bandwidth had several settings. To me, the Silvertone was the real thing! I talked my dad into giving me half of the space on one of his work benches in the basement for my radio shack, and that spot became the focus of my existence for several years to come.

With the Silvertone's b.f.o. capability, I could set out to learn the code in earnest. At first, what I could hear on the hambands was indecipherable, but eventually I began to catch individual letters, and finally groups of letters. I heard about the W1AW Code practice sessions somewhere, and finally found W1AW after several weeks of searching. That did the trick. It wasn't long before all of my listening time was spent in the c.w. section of 20 meters, and I was astonished at all the foreign stations I was hearing. Needless to say, my desire to talk to them was inflamed, and getting my own license became the passion of my life. It would take several years before I actually established contact with one of them, but it was my goal. So I turned in earnest to getting my license.

A borrowed *How To Become a Radio Amateur* became the most important book in my life. I'd managed to scrounge a couple copies of *CQ* and *QST,* and I'd read and re-read the articles until they began to make some sense. To an eleven-year old boy, 'grid-leak' and 'bias' and 'r.f. choke' conjured up images hardly related to radio theory, and these were mysterious words with a hidden power to me, just like the words of the religious ceremonies in Latin, but they were also keys to the mysterious world of radio, and I learned them and what they meant, even if I didn't have the slightest conception of what they represented in terms of radio theory. When I finally found an old copy of the *ARRL Handbook* in the local library, I was ecstatic -- here was the 'bible' of amateur radio and it had everything in it that I needed to know.

But it was very difficult for a boy, working on his own, to grasp how all of this 'radio stuff' actually worked. I recall puzzling for days over a receiver circuit front end tank coil. I understood that, in electric circuits, wires had to be connected, and I couldn't see how the circuit could work if the primary and secondary windings of the tank circuit had no physical connection. At first, I decided that the printer had made an error and left out a line which would show the wire connecting the primaries and secondaries of all the coils. Pleased with my discovery, I dutifully drew connecting lines between the primaries and secondaries of all the coils to correct the printed schematic, and to save the next guy who got the book the trouble of figuring out what I had just corrected, or worse yet, of actually trying to build it the way the schematic showed, and being disappointed when it didn't work. I'd study one section of the *Handbook,* and go back to another, and eventually, each time I'd go back another question would be answered, another aspect of the 'radio magic' would make sense. This took a long time and a great deal of puzzling over the secret mysteries I was attempting to master. Ultimately the process would require two years before I acquired the Novice Class ticket.

By the time the *Boy's Life* contest rolled around the next year, my code speed had crept up to about ten words per minute, and I was ready to assault the top of the score list. My strategy was simple -- while the rest of the guys were scrounging stations on the broadcast bands, I'd be sitting on 20 meter c.w. just racking up a big score. In fact, I did a lot better, logging about 260 stations in about 45 countries. It was quite an accomplishment at the time, and the great improvement in score was the result of a lot of determined effort in learning the code. When the results finally appeared in print, I started looking for my name at the top and as my finger traced farther down the page, my spirit was swept with a wave of disappointment -- I found it way down around #38 on the list. I couldn't

believe that I was that far down, but I was, and after the disappointment passed, a new determination arose for the coming year. It would be the biggest contest ever sponsored by the magazine, with two or three National Radio shortwave receivers as top prizes, and about fifteen other tangible prizes. The ARRL Code Sessions became a moral obligation, just like church on Sunday. I'd keep the receiver tuned to c.w. stations as I studied over the *Handbook* and *License Manual,* as well as looking through *QST*'s and *CQ*'s. I'd try to get away with doing my lessons while listening, but my mother was an ex-school teacher and figured that my homework efficiency would be lowered considerably in this approach.

In the meantime, I began scrounging around garbage dumps looking for junked radios whenever the occasion arose. Most of the junkers I'd stumble across were total losses due to corrosion and deterioration, but every so often, I'd come up with a real find. For a while, I'd check the parts in them against the parts I could make out in *Handbook* pictures but this was problemmatic, since most of my finds were so old that the parts no longer corresponded to anything I'd find in a picture. Even so, I'd tear the parts out and save them, figuring I'd find out what they were later. Once I found a receiver of the late 1920's variety, with the tubes that looked like lightbulbs. I actually got this one to work on the local station on the a.m. band, and it was a great triumph for me. It gave rise to a love of tinkering behind the panel that has remained to the present. I still didn't have much of an understanding of what made a radio work in theory though.

Events converged in the spring of my seventh grade year. The big contest rolled around and I was almost ready to take the Novice Exam at the same time, but put it off until the month long contest period was over. All of my effort went into the listening contest. I had decided that, while the Rules stated that only a one hour listening period could be logged each day, the top placers used clocks which ran considerably slower than the ordinary variety, and that the only way to compete was to use a similar interpretation of the Rules. I played it too honest though. I only squeezed about two-three hours of listening into one hour's worth of log entries, and I figured this would be stretching the Rules enough to win a brand new receiver. My log was phenomenal. I forget the exact numbers involved, but I logged over a thousand stations in about 148 countries. The log was about fifty sheets long. When I sent it off, I was certain that I'd turned the trick. Who could beat that? So I went ahead on the license exam.

One of the locals, W3PON, who used the phonetics 'poor old nelly' on the air, obliged me by administering the exam, and let me know I'd gotten the percentage necessary to pass. He was impressed with my code speed, and told me that, as he watched me easily copying at 5 w.p.m., he kept speeding up to about 12 w.p.m. until I began to get nervous. He got a good laugh out of my misery! I didn't mind though. I'd be a ham shortly!

My efforts turned toward putting together a transmitter. I finally found a simple circuit that I decided to attempt. But the parts list revealed that my junkbox had a lot of useless material in it, except for a power transformer of unknown output, something that looked like it would pass for a power supply a.c. filter choke, a key jack, some screw-terminal strips, and wire. I checked out what I needed in the Walter Ashe Catalogue, and could put the thing together for about $8.50, not including crystal. This was a considerable sum of money in those days, especially for a kid. My parents didn't consider the investment important enough to back the project. So I was in a quandry, and my frustration grew as the days passed and all I had managed to accomplish was studying the article and circuit till I had memorized it. I was no closer to having a transmitter on May 5, 1955, when my *WN3COB* call arrived in the mail! I was elated at having my own call, and inscribed it on all my school notebooks and personal belongings, as well as restroom walls and other likely graffitti locations. The world would know that

WN3COB was around, but unfortunately, they'd find out by reading the call rather than hearing it on the air.

Out of desperation, I decided that my only approach to getting the transmitter parts was to visit local hams as often as possible and beg, borrow, or steal whatever I could. I got pretty sneaky about it. On the first visit to one of the local hams, I'd pretend great interest in his demonstration of his rig, but my shifty eyes would be scanning his workbench for parts I could use. I'd mentally note what I'd seen and where. Then the next phase was launched, namely, acquiring what I had located. I managed this by going back for another visit, and since the rig demonstration had been taken care of on the first visit, I would pretend that my wandering eyes had just 'noticed' the stuff on the work bench, and I'd get very enthusiastically interested -- "Boy, what's all this stuff? Gee you sure must know a lot about radio stuff to use all these parts." And I'd end up, after the buttering-up phase, just stumbling across the very part I'd noted before and would go on about how this is the very last part I needed to finish my transmitter and get on the air, but I had no money, and so, in a real gloomy tone, I would conclude that I'd just have to wait till I got the money. It is a credit to the typical generosity of the ham population that I never had to ask for one single part -- they were all offered to me by the individuals involved, who were very pleased to help out this bright eyed kid. In this manner, I picked up the 5Y3, 6V6, two new octal sockets, an electrolytic filter capacitor, a 140pF a.p.c. variable capacitor, and a 2.5mH r.f. choke, plus a few odds-and-ends. By the time my birthday rolled around in late June, I was hard at work cutting a chassis out of masonite board, screwing it together, mounting all the sockets and jacks and switches. I took painstaking care to do a perfect job so that I could be proud of my first transmitter.

The 'WN3COB Special' 3-Watt Transmitter. *Both power supply and transmitter are built on chassis of masonite stock. The power supply uses a 240 v.a.c. transformer scrounged from a receiver, with 5Y3 rectifier; the large vertical filter choke is at right. The 6V6, a.p.c. plate tuning capacitor, and plate coil on 3" form are visible, with the 6V6 obscurring the octal socket used as a crystal socket.*

There were several 'custom' additions to the basic chassis. Since I couldn't afford a meter to monitor output, I decided to use a flashlight bulb in series with the antenna lead as a tuning indicator. But purchasing a pilot-light socket and red face was out of the question. So I scrounged one of the red plastic geegaws that decorated the gun-belt of one of my friends, glued that to a stand- off washer, and glued that to the front of the panel. I salvaged a pilot light socket from a

junk radio, and used a feed-through washer that fit snugly around the bulb as the means of mounting the bulb behind the red plastic face. All the pictures in the magazines showed plug-in coils, so I used the base of an old five prong tube and a socket from a salvaged radio for the plug-in coil hardware. The octal socket that served as a crystal socket could hold two crystals, so I added a switch from an old radio for two-crystal switching capability. One major problem was that the a.p.c. variable had no shaft: it was a screwdriver adjusted type. After a lot of searching, I found a knob whose shaft receptacle extended beyond the front of the knob-body about 1/4-inch, and then it was just a matter of fitting it over the a.p.c. variable mini-shaft. I wound the tank coils on a form salvaged from another radio. In a final effort to make the transmitter look like the real thing, I tried painting it with aluminum primer that I found laying around my dad's work bench. I couldn't succeed in getting the professional metal appearance that I wanted, so I didn't paint the front panel.

When I finished the project, I was really proud of the results, meager though they might seem now. Meanwhile, I'd talked my dad into paying me for washing the car, and had enough to purchase a crystal, which, after much deliberation, was picked for 7177 kHz, operation -- right at the edge of the old Novice allocation. When I finally had it all ready to go, I hooked a Christmas tree bulb across the output terminals as a dummy load, and the red glow of the bulb sent chills up my spine when the realization flooded into my consciousness that all the effort that I had put into radio for the past years was ready to pay off! I picked up about 100ft of scrapped 300 Ohm twinlead and cut it to length for a 40 meter folded dipole, and mounted it at the dizzy height of 8ft! But it loaded up and the glow of the output indicator bulb was proof that I was putting a signal on the air. The 6V6 was developing 3 watts r.f. output, according to recent measurements.

But, alas, I called stations for a couple weeks without making a single contact until one of the locals came across me on 7177 kHz and gave me a call. That was my first QSO and I was so nervous that I had to keep correcting mistakes every other letter that I sent. I had decided that I'd waste a lot of time on the air using my full name 'Adrian', so I'd use the 'handle' -- 'Ben'. When Tom came back after my first 'RST QTH NAME' routine, he solved the name problem by calling me 'Ade', short for 'Adrian'. Later we talked about my failure to get out, and he noted that I had to get my antenna up off the ground. So I scaled the first of many roofs and tied the end of the antenna to the chimney-mounted T.V. mast, with the other end up in a tree at about 30ft. That turned the trick! I started making contacts regularly after that.

The hassles of getting this whole operation on the air had made me forget about the *Boy's Life* SWL Contest which I had figured I'd won hands-down. But one day a strange five-foot long package was waiting for me when I got home from school and I was totally baffled as to what it could be as I cut it open. Inside was an FM omnidirectional dipole antenna, and I was even more baffled -- until, finally, I realized that I was waiting for a shortwave receiver, and what I had won was an FM antenna! I'd only managed to rank 15th in the SWL Contest -- still far away from the top!

But the disappointment quickly passed, for in the late afternoons of chilly, overcast, autumn days, I was hearing WN3COB coming back to me over the speaker from states all over the eastern part of the U.S. And in the wee hours of the night, when my parents were asleep, I'd sneak down to the basement and sit bleary-eyed in front of the old Silvertone, warmed emotionally by the glow of its big dial, and I would stare into it intently as I tried to see where the W5's or W0's were located out in that mysterious radio world from which they were calling me. As autumn dragged on and winter propagation set in, the W6's and W7's started rolling in and I concentrated on calling them. Finally, one night my slow c.w.

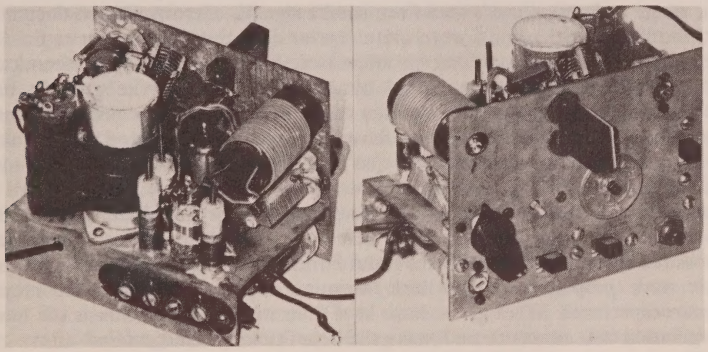
brought back the long-awaited 'QRZ' from a W6, and I strained nervously to put as much intelligibility into my little signal as possible in order to get through to him. He dug me out of the QRM and after about 20 difficult minutes, I had finally successfully spanned the continent. I was ecstatic for days after that contact, and more were forthcoming. I walked in a sense of awe that I had mastered the mysterious radio world. I was finally talking back to those signals from out there, and they were hearing me. That was ever so much more fascinating and exhilarating than just listening!!

So it was then, and still is! Sitting up there behind my tent, I found myself rather amused at my limited boyhood comprehension of the mysteries of the world of radio. But the memory of staring into the soft glow of the dial and pressing hard on the key to make my signals more intelligible was as fresh as the experience of working the UA1 from my tent moments earlier. I was impressed with the fact that certain parts of the radio experience remained exactly the same now, despite the passage of many years. I wondered about the differences that the years had brought, differences which didn't change the essence of the experience. Of course, the externals were quite different. Back then, I used homebrew transmitters with a single tube or two built into wood chasses with scrounged parts. Now I use solid-state transceivers no larger than a paperback book and capable of far more sophisticated operation. Such equipment was only a boyhood dream back then.

But other differences had occurred, perhaps more significant differences because they had given me an insight into how mysterious the world of radio actually is, always withholding a portion of its secrets no matter how much I learn about it. Years of study had allowed me to answer all the questions about radio that I had puzzled over as a 12 year-old. But those years had raised even broader questions about Man and the world he lives in, and how radio fits into that picture. The mystery of radio, I discovered, was only a segment of the vast mystery of the universe and life itself. My boyhood fascination with the unknown that was 'out there' was the same fascination that Man has felt about the vast cosmos since his very beginnings. I realized that, as I had stared into the dial and tried to decipher the sounds coming from the radio, I had been driven by the same desire to know which had turned the eyes of the ancients toward the vast sea of stars above them in the night sky, and had triggered their imaginations to decipher the secrets of that sky. It was the same desire to know which led ancient cultures to discover the regular patterns of stellar motion and the meanderings across the sky of a few irregular 'stars' which they named 'planets' or 'wanderers'. They sensed that the movements of these celestial bodies were in some unfathomable way related to human existence, with its ebb and flow, and from their imaginations emerged the 'science' of astrology, the astronomical observatories scattered throughout the ancient world at Stonehenge and other places, the geocentric Ptolomaic universe and its complex mathematical proof, all of which evidence a sophisticated effort at understanding the heavens. Complex influences upon Man's destiny were imagined to emanate from the stars; and Christian theology of the Dark Ages hypothesized that God transmitted his plans for the human race thru the stars, reserving angelic messengers for special occasions. But Man experienced the same desire to know when he looked about himself in this earthly environment, seeking to decipher the secrets which underlay the workings of familiar phenomena, the workings of his own mind and body, and ultimately, life itself. To the modern mind, the explanations which the intellectual curiosity of the ancients generated are incredibly naive and almost ludicrous. But no more naive and amusing than my boyhood conceptions of such magic words like 'grid leak' and 'r.f. choke'. When confronted with the unknown, human nature is driven to understand it, and as a boy, I experienced that drive and wondered and

puzzled; little did I realize that my inquisitiveness tied me directly to a thousand generations that preceded me. My years of schooling revealed that connection and helped to explain why the radio experience had not changed in its essence -- the mystery of radio calls to the human soul itself, and that call and the soul's response is ageless and timeless. The glow of that dial and the sounds emanating from the Silvertone triggered my imagination and fed it the material with which to weave unlimited visions which my human need to understand required. And I imagined magical influences and forces in operation out there not unlike those imagined by the ancients.

K8EEG College Transceiver. *Measuring 3 x 4 x 5 inches, the crystal controlled unit provided 3-4 watts output on 80, 40, and 20 meters using a 12AT7 dual-triode oscillator buffer/doubler driving a 5763 final. The pi-net coil, plate and antenna a.p.c. capacitors are mounted at right of front panel, with oscillator homebrew slug-tuned coils at rear. The voltage tripling power supply filter capacitors fill the left rear and obscure the regenerative receiver section at left front panel. A filament transformer was carried separately.*



My education had followed a rather curious direction that kept me in touch with both the world of empirical observation and the world of imagination, which is fed by intellectual curiosity. Scientific subjects never failed to capture my interest because they promised an understanding of the mysterious forces that called me to my radio. But the philosophy and literature revealed the imaginative and intellectual efforts of many others in their attempts to explain how all the bits and pieces fit together as a whole, and made sense of Man's place amidst the vast powers operative in a limitless universe. The poets I encountered spoke of Nature and her forces as almost personal entities interacting with Man as one being with another, and what they wrote often reminded me of the intimate communication with Nature I knew in my radio experience. As a boy, I had spent many hours in front of the receiver, puzzling over the strange effects superimposed upon incoming signals that made them flutter, waver, take on a 'watery' characteristic, fade in and out rapidly, disappear only to reappear and reach even stronger peaks than before. It was as if these effects contained some kind of encoded message about the behavior of the forces which made radio possible. When I learned to recognize these effects, they took on a familiarity that made me feel close to something, or *someone,* more properly. The poets spoke of such a feeling, and I could identify with it. Of course, science offered impersonal explanations of the dynamics of electromagnetic wave propagation, but for some reason, the impersonality of these explanations never robbed the radio experience of its essential familiarity. The view of the world through the eyes of

science reveals a stark, cold, panorama of forces and phenomena occurring regularly according to immutable laws of physics, and that is ultimately the true view, but it can never outweigh the emotional intensity experienced by a human being interacting on a personal level with those laws and forces.

Ultimately, we radio operators find our fascination to be based upon a personal interaction with Nature as the poets would have it, or else we become pure scientists and cease to be interested. In that case, we miss the meaning of radio in the overall picture. We are human beings, and we relate to all phenomena out of our personalities. Every exploration into the unknown is ultimately a confrontation between an individual human being and Nature, and unless we explore in the totality of our being, we miss the significance of our discoveries. Consider Marconi's exploration into the unknown realm of overland, and then transoceanic communication via the propagation of electromagnetic waves. Behind him lay Man's age-old effort to communicate beyond his immediate environment. Since the dawn of history, Man has attempted to extend his range of communication, but he had always been limited in his ability to reach out and speak to others beyond the reach of his voice and vision. He devised many methods to extend that range -- drums, flags, signal fires, smoke signals, mirrors, written documents, and the like. But the limits were quite narrow until the discovery or radio. Marconi must have understood that his effort to test the possibility of communicating with electromagnetic waves placed him on the brink of the greatest break through in human history -- the ability to communicate across vast distances instantaneously. Surely Marconi must have *felt* as well as understood the magnitude of his possible success as he sat in that shack in Newfoundland listening to the clock tick down to the appointed time for the test. Surely the scientist's 'my hypothesis is substantiated by this experiment' must have been totally overshadowed by his human realization that 'now we can speak across continents, across oceans.' Indeed, the laws of Nature, including those governing electromagnetic wave propagation, have little meaning unless placed in the context of human experience. What gives those laws their magical dimension is the human imagination that adapts those laws to the benefit of mankind.

So it seemed to me, as I mulled over the differences the year's had brought to my radio experience, the essential feature was that radio had remained an important part of my life precisely because I was human and it gave me a direct contact with the secrets of the universe, as well as enabling me to communicate with others like myself. With my radio, I would ride Nature's own forces to do what Man had dreamed of since time immemorable and had even created Gods such as Mercury to symbolize.

My reminiscences were cut short by the return of the showers, and I headed to the tent, and during the last few days of my vacation, I'd periodically return to pondering the experiences and realizations that separated me from that boy I was. In looking back upon my mental meanderings, several experiences take on special significance.

One afternoon, I was sitting on the lake shore, with the steep tree-covered bank behind me, my bobber floating in front of me, as it had for days without a bite, and kept feeling reminded of some experience which I could not quite drag out of the corner of my memory. It had something to do with beginnings and fascination. The key to the riddle was that I wasn't being reminded of one of my own experiences, but of the experience of seeing the spark of fascination ignite and flare up in the faces of a group of youngsters whom I'd just introduced to the magic of radio. The memory came flooding in upon me as soon as I turned the key. I saw in their faces what my own beginning must have looked like. I suppose I hadn't thought of the radio experience as having a 'beginning' before that experience with those kids. When I started out, I did it alone, and I never saw in

some older ham's face that satisfaction that comes from recognizing the spirit of his beginning reappearing in a youngster.

It happened during the summer between my junior and senior years of college. In April, I had realized that I was running out of money and had no prospect of a summer job. Just by chance, I ran across a 'Summer Job Opportunities for Students' brochure in the library, and one ad caught my attention immediately. A camp in southern West Virginia wanted to hire a college student with a ham license and equipment to teach radio as part of the camp's program -- for money! That was difficult to believe in the context of my experience of summer jobs -- to get paid for teaching other people about the thing that had been an obsession for me during most of my life? I had the application letter in the mail four hours later, and in it I mentioned every possible marketable form of skill or experience that I possessed -- years of Boy Scouting, varsity athletics, debate, leadership awards, and everything else I could think of. When I received an acceptance letter in mid-May indicating a salary of $350, I was astounded. I had never dreamed of such a thing, and yet it was a dream come true! Early June found me traveling south thru the mountains, beside a broad, swift-flowing river. It was like a paradise, a perfect setting for this 'dream come true' of teaching radio.

During my wanderings from location to location, I'd built my station into a large wooden fruit-crate, and I'd developed a portable, collapsible antenna by winding 250ft of wire on a four foot bamboo pole and 3ft fiberglass fishing rod. I'd hang the assembled antenna from the ceiling or lean it against the wall when operating. For matching purposes, I placed a variable capacitor across several turns at the bottom of the antenna, and adjusted for maximum antenna current with top-feed. The rig was homebrew using a 6L6 final, and v.f.o. control on 80-40-20 meters. It didn't look like the rigs in the pictures in the magazines, but it worked well!

My job was to introduce a group of 7-14 year-olds to radio, and teach them enough to enable them to build a shortwave receiver to take home as their camp project. For our first class, which met in a corner of the 2nd floor of the large, open, crafts building, I began by explaining amateur radio to them, and then demonstrating the code as a prelude to a couple demonstration contacts. I explained the code to them first, showing them how some letters sounded so that they would understand what was going on. The demonstration consisted of making 2 contacts and having the other guy say 'HI' to selected members of the group. I spelled out the incoming letters, and when one of the group recognized his name, he'd get wide-eyed and exclaim "Hey, that's me he said HI to!" Needless to say, they listened ever more intently, staring at the weird contraption which relayed greetings to them from hundreds of miles away. Everyone tried to get in on the act. There were constant reminders: "Tell him to say HI to me". I did. After the demonstration, the kids were all excited and all talking at once, but the gist of their comments was the same: "Can I learn to do that?" The two demonstration QSO's had their desired effect, but one of them served a double purpose -- it showed me something that put hamming in an entirely serious light ... but I'll tell about that a little later.

I explained to the group all that was necessary for becoming a ham -- studying regulations and theory from scratch and passing an exam, and learning the code. I cautioned them that we only had about 6 weeks, and that each individual would have to work very hard, but I'd teach them what was necessary. I told them not to say 'yes' unless they meant to stick it out to the end and follow my directions. Ten made the commitment. They worked hard despite the fact that summer camp was supposed to exclude any book work. When the code frustrated them and they were ready to give up, we'd go back to the rig for another demonstration, with me spelling out the information coming in, and then, in a couple weeks, they

began to recognize letters and then words, and that cinched their determination. Now that I look back on it, I asked a heck of a lot from those kids, and they delivered! Five weeks later, seven jittery, scared kids took their places around the table for the code test. I'd drilled them to death. Nervous faces exploded into glee as I corrected each test and passed it. They did well. Then came the written exam, and I've never seen so much fidgeting and throat- clearing in my life. But seven passed and cheered when they realized that, yes indeed, they would be receiving their licenses shortly after returning home. They would be able to talk back!

I was amazed, quite frankly. Several nine year-olds were in the group, but they learned and I just know that for them the memory of that summer consists mainly of chilly mornings spent in study and code practice. Later, I received notes from several of them, informing me of their calls, rigs, and contacts. Before I started out, I had no inkling of this part of the experience -- *they* thanked *me* for the fun they were having.

But there was one kid whom I did not allow to work with the group. He was only seven, and obnoxious as only spoiled rich kids can be. I didn't like him from the start. When the group decided to follow the license acquisition route, they gave up the shortwave receiver project because there would not be time to accomplish both objectives. But the little seven year-old persisted: he wanted to build a radio, and he always got what he wanted, and that was the end of the discussion as far as he was concerned. And he had clout. The camp director commanded me, over my objections and explanations, to see to it that this kid arrived at home at the end of the summer with a working shortwave receiver, and there were to be no 'ifs, ands, or buts, about it.'

I approached the task in anger, and pushed the kid hard, making him learn schematic symbols and the parts they signified. I trained him in making solder joints. I cut and bent and drilled the chassis, and showed him how to assemble it. His fingers barely had the dexterity to thread small nuts on screws. I was patient though angry about the situation, but the funny thing is that he never seemed to sense my anger: he only seemed to pick up on the patient instruction and the receiver growing before his eyes. It was a long, hard pull, but we made it. Two days before camp ended, the receiver was completed, and luck was on my side -- it worked! So I sent him off with a sigh of relief, with strict instructions forbidding him to use it before he arrived home: the only electrical outlets in the camp were in the showers, and the receiver used a voltage-doubler, rectifier circuit straight from the a.c. mains without benefit of a transformer. Believe it or not, the next morning a counselor had to pick the kid up off the shower room floor -- he had plugged the thing in while standing on the wet floor in his bare feet just after jumping out of bed before everyone else! I shivered at what the results could have been, but I wouldn't have been able to stop him anyhow. The kid was a pain, and I was glad that our ordeal was over. The story doesn't end here though.

About a month later, I found a rudely scrawled letter waiting for me. The handwriting was a 'first effort' quality, with lines running haphazardly across the page, unequally sized letters, and mispellings. But it was from the rich kid, and it contained a simple message: "I am writing to tell you my radio works. I have a lot of fun with it. I heard the Voice of America, BBC, and Radio Moscow. Thank you." Somehow, I couldn't conceive of this spoiled kid thanking anyone for anything, let alone for a simple radio which could be replaced by new Collin's gear out of his father's pocket change. That he took the time and effort to thank me for helping him build a little shortwave receiver costing about $9.00 hit me with the significance of what I'd done: I showed him how to build his own, helped him to build it, and he listened on a receiver which he had built himself, and for that,

he broke all the rich kid rules. I gave him something that his father's money could not buy, and that was a beginning in radio made possible by building his own gear. I began in the same manner, and that is why my beginning was so exciting! The kid helped me understand that for the first time.

I mentioned earlier that one of the demonstration contacts for the group taught me another important lesson about hamming. It's a longer story, and goes back to my high school days in the late 1950's when I became a member of a group of seven young operators who met faithfully at midnight every night during the summer of 1959 up on 7199 kHz. We'd check in and chew the rag until the wee hours, clipping along at 30-40 wpm. It was an interesting group because our discussions were not limited to hamming subjects. We became personal friends because we shared our ideas, our activities, our plans, and our problems. All of us except one, that is. We could never get a straight answer from him as to his occupation and plans: he always countered questions with a witty comment that deflected the discussion to another in the group. I couldn't understand why he did that -- until I met him after several years in the second demonstration contact at the camp.

During that QSO, we made a sked for that evening, when I found out that he was only about two hours drive away. I became excited about visiting him, but he hemmed and hawed, and finally my enthusiasm for the proposed visit forced him to reveal the personal facts of his life that our group had never been told. He was a disabled veteran from the Korean War, an invalid whose only contact was his immediate family. The trauma of the wounding had destroyed his self-confidence, and it was irreversible. There was a psychological disorder which accompanied the physical disability. The comprehension of what he was trying to tell me as the reason for refusing a visit slowly donned upon me during the rapid exchanges, and when it became fully clear, I sat there, stunned with the reality of his life. He could not feel that he was a whole person to anyone who looked upon him. But he could feel normal, a regular guy, a part of the group only via amateur radio with his on-the-air friends, because they were the only people who could see his personality, his wit, his intelligence, without having to look at his body! On the radio, he could be his witty and sociable self and be known and accepted for himself without confronting that look in people's eyes which unconsciously says 'I will treat you nicely because you are so unfortunate.' On the air, he was an equal, a complete person as far as we were concerned, and he accepted our friendship because it didn't come attached with pity or sympathy. The implications of his predicament affected me for days, and I still feel that whenever I think about him. To him and others, amateur radio is the only means of communicating with other people, of finding friends, of belonging to humanity, without a physical disability cancelling the genuineness of the relationship. Amateur radio is their link to society, the only link that works for them. I guess that I had always seen it merely as a hobby, an activity that can do serious service for the public welfare in emergencies, but for the most part, a hobby for personal enjoyment. For some, however, it is the most deadly serious activity in their lives, without which their lives would be devoid of the human companionship that we all need. Now, every signal on the air is potentially an individual who relies on his fellow amateurs for a vital part of his life experience.

Now that I look back on it, that short vacation spent beside the lake, operating on my elbows and stomach inside the little puptent and doing a lot of reminiscing as I watched my fishing bobber ride the waves undisturbed by the fish, brought me into contact with some of the most important experiences that had influenced my understanding of radio, how it fit into my life and into the lives of others, and how it fit into the world in general. It is strange how the meaning of individual human lives becomes clear. We face the future with definite plans and

plug along, but when we look back after several years, only then do we discover where we'd been going and how we got there. That's what happened during the camping vacation in regard to me and my radio experience. Since then, I finally figured out why amateur radio means QRP to me.

It wasn't until about 1967 or there abouts that I became aware of the fact that my experience of radio was ultimately defined by low power operation. During the preceding years, I had been limited to QRP operation by circumstances. I had been pursuing my education, and hence I was always broke and couldn't afford to even think of new 'store-bought' gear. I always preferred building my own anyway. I had never felt the need for high power since my hamming was always exciting and fulfilling. At about the time when my financial situation improved beyond mere subsistence, I ran across an ad for a Globe Champion 300 for a ridiculous price that even I could afford, and I wondered, 'why not high power?' So I tried it, and found that a disturbing change occurred in my experience of radio. Once the newness of the toy wore off, I realized that radio had lost its thrill for me. My attitude about operating had changed. Up to that time, I had always listened intently to the sounds which provided the clues about propagation conditions and the like, and I had formed my operating habits accordingly. But with 350 watts input at the other end of the key-lead, I no longer listened, nor did I search out stations. I expected to get through regardless of conditions, and I expected to rule my little chunk of the radio spectrum. The Champ had become a weapon, rather than the tool for communicating that it was supposed to be. Operating lost its emotional dimension -- I no longer communicated with Nature, no longer had concern for the human beings at the other end. I was merely interested in flexing my muscles, clearing the frequency, routinely impressing people with my signal. The frustrating part of the whole high power episode was my awareness of the fact that 350 watts was simply not enough power to play the power game successfully. Others with less power were competing with me for DX contacts and winning.

I realize now that I had lost touch with the essential feature of Man's relationship with Nature. True, we profit from a technology that provides sophisticated methods of challenging Nature's limits, and we can enlist great amounts of r.f. power in a brute force confrontation with her limits. Somewhere along the line, our fascination with power of all kinds has deluded modern man into thinking that our megawatt transmitters are a match for Nature's monumental forces, but ultimately, we cannot win in such a confrontation. The forces which enable radio communication have evolved and endured through the 15 billion years that scientists believe separate us from the very beginning of the universe. Our technology has existed no longer, in comparison, than the solitary flash of a strobe in the darkness of a long winter's night. The greatest powers that we can summon up can be swept away by Nature as easily as a straw blown away by a galewind. Man can succeed only if he accepts Nature's limits and plays the communications game according to her rules. Despite his most deliberate planning and investments of time and energy, a minor solar flare can totally negate his purposes. The key to the communications game is to enlist Nature's own forces in the effort to communicate. I realize that my listening habit in operating was an attempt to do just that -- to listen to Nature's coded effects toward discovering what she would allow at the moment. Low power operation was a cooperative effort in which I accepted Nature's rules and was rewarded handsomely.

During the high power episode, I didn't understand why radio had changed for me or the meaning of the change--I only knew that it had, and radio was no longer what it used to be. Until, that is, I made a contact one day while the Champ was accidentally still in the low power 'TUNE' position. The signal report that I received displeased me, but when I discovered that I was only putting out

about 7 watts, the old fascination came flooding back into my experience of radio. I left it on TUNE, and went hunting for contacts, once again listening to the mysterious sounds indicating the shifting propagation conditions, and I was once again excited when I made contact. I was once again grateful to be able to communicate with a distant stranger, and ultimately, I accidentally rediscovered my beginnings in that monstrous 120 pound hunk of metal as it pumped a few watts out into my antenna and from thence into the vast reaches of space. It was then that I realized that the low power framework defined what was essential about radio operation for me.

Nothing could stop me from being once again immersed in radio. Every trip past the old RME-69 detoured into a 'quick listen'. But something about operating QRP with the massive Globe Champ just didn't feel right, so I whipped up a 6AQ5 v.f.o. with pi-network matching for 160, 80 and 40 meters and power supply on a pair 3 x 2 x 6 inch baking tins. That felt more like the real thing! When glancing through radio magazines, my attention focused on potential QRP rigs and ideas. I ran across an old article detailing a cheap and easy way of getting on sideband with a double sideband (d.s.b.) circuit. Before long, I had a pair of 2E26's on 75 meter sideband driven by the 6AQ5 v.f.o. and power supply. The rig put out less than 1 watt p.e.p. But tied to my phenomenal 1900ft longwire up 90ft, it was like shooting fish in a barrel! After ranning across the County Hunters Net on 3935 kHz, I gave hundreds of CHC'rs their QSL for Athens County (OH). No one knew that I was running such flea power until I let it be known apologetically one night when conditions were especially rough. While I was trying to complete a contact, some QRO 'lid' broke in and criticised me for holding up things by being stupid enough to use such low power. That was like a kick in the gut and destroyed the excitement for a moment. But the gang came to my rescue. A 'list' immediately developed and one by one they called and reported "You're a 5 by 6 here OM. The QRP is doing a good job passing Athens County around. Keep up the good work". They restored the joy of it! As so often happens in QRP, the operator at the other end adds to the satisfaction.

Somewhere around 1967 I was poking around 20 meters and ran into Val Buccichone, W9IIL, who was using a 20-watt transistor transmitter. Just working a transistor transmitter was exciting, and I talked W9IIL into sending me the dope on his rig (which eventually appeared in an issue of *The Milliwatt*). As a result of the QSO with W9IIL, I ended up patching together parts of several magazine circuits into a v.f.o. controlled transistor rig which put out around 500 milliwatts. It was a whole new kind of thrill, the kind that the QRP'rs of the 1920's must have felt with their first vacuum tube rigs. It was pioneering a new territory as far as I was concerned. Ironically, that 120 pound hunk of steel led me into a genuinely new beginning in amateur radio!

And ultimately, my understanding of QRP took shape from that second beginning. The QRP operator understands and accepts the reality of the communications situation, and bases his operation and approach upon the assumption that he will succeed only if Nature permits. His method is not forceful confrontation, but cooperation with Nature's limits and forces. He seeks, like Marconi, to understand those forces, and to devise methods of manipulating those forces to his advantage. Using power levels that make him highly vulnerable to Nature's sometimes whimsical behavior, he attempts to discover the lower limits of possibility, to find out how low a power Nature herself will tolerate for successful communications. In taking this approach, he must learn Nature's laws and behavior, he must learn to read the coded effects that signify the operation of her forces upon which communication by radio depends. In operating at power levels where a 2dB loss renders his effort at making contact unsuccessful, he seeks to discover and define the lower threshhold of the power vs. distance dimension. Operation

with a kilowatt serves only to obscure the fine distinctions; QRP operation magnifies them, provides the operator with a keener understanding of the phenomena of propagation, provides the scientist with challenges to theoretical predictions regarding path loss, and perhaps, challenges the current concepts of propagation because the QRP operator has shown that what is theoretically impossible can be done, and done repeatedly! That is why QRP operation never loses its suspense and thrill. The QRP operator is always stacking the deck in Nature's favor by giving up his power advantage, attempting to communicate with as little power as is possible. When he succeeds, it is the triumph of an individual human spirit in the vast cosmos dominated by Nature's monumental forces. When he fails, he is confronted either with his own lack of skill and knowledge, or with a discovery of a lower limit in the power vs. distance dimension. Ultimately, though, his approach brings him into an intimate connection with the mysterious forces of Nature which make radio communication possible.

The QRP operator is a pioneer, an explorer into the unknown, and has given the world of amateur radio the only new discoveries that have emerged in the last decade. The chief discovery is that so little power can go so far, and that should lead all to question the need for the runaway high power mentality that seems to have emerged in the last decade or so. I suppose that I have been disappointed that amateur radio has taken such a direction and the world of amateur radio has changed so much since my early days.

Back then, most of the commercial transmitters on the market ran 30-75 watts input, like the Viking Ranger, the Lysco 600, the Eldico units, the Heath AT-1 and DX-20. If I recall correctly, only Viking put out a high power transmitter. Things seemed quite different on the bands then. I may be romanticizing my memories, but those of you who were around during the 1950's can decide whether I'm being accurate or not. But it seems to me that I rarely encountered horrendously powerful signals, so my few watts managed a greater number of contacts than seems possible today. I do know for a fact that the bands were almost totally dominated by gentlemanly conduct, and obscenities and rude remarks were not only unheard of, but unthought of.

It seems to me that I had very many contacts in which our homebrew gear was the major topic of conversation. I remember having many questions answered for me on the air when my puzzling over the *Handbook* failed to yield an answer, and I don't remember running into many fellows who couldn't provide the answer right off, with a good explanation thrown in to boot. Seems like most of the fellows I contacted knew what was behind the front panel, and what made it work, and how to fix it if it broke. As I said, I just might be making the situation out to be better than it actually was, and I stand ready to be corrected, if that's the case.

I remember reading about the Old Man back then, and he always kept hams on the right track with his 'down to earth' comments. I never figured out who the Old Man actually was -- maybe they just made him up. A few years ago, after being disturbed by behavior on the ham bands, I thought it might just be a good idea to bring the Old Man back and see what he would have to say about the way things are. So I wrote a story to show what I imagined his reaction would be to today's amateur radio world. I couldn't think up a witty title which would get the whole point across, so I just called the story *A Visit from the Old Man.* It went like this...

A Visit From the Old Man.

I had a strange experience a month or so ago and I've done a lot of thinking about it. Some of the details have become fuzzy, but I think I remember the basic drift pretty well. One thing is certain: it made me do some serious thinking, and you know, a lot of what the Old Man said makes sense.

The XYL and kids had turned in after the July 4th fireworks and I was sitting out on the porch steps with a pipeful and a cold beer, just absorbing the cool evening air and thinking things over. I like to do that when the evening quiet makes for clear thinking. I didn't pay much attention to the slow steps and tapping cane until the Old Man turned into my front walk and approached me. It was hard to make out his features in the moonlight, but he wore a white suit and panama hat and had a white mustache -- reminded me of a picture of Mark Twain that I'd seen somewhere. He was the sort of fellow that inspires respect, and when he broke the silence with *"Even'in young feller, sure a nice quiet night"*, I responded in a similar, quiet tone.

"Just passing through town here, and figured that while I was here, I'd drop by to chew the rag with you. You're the feller that writes that low power column in CQ, aren't you -- what do you call it, QRPp?" emphasizing the little 'p' as if it was something novel and strange to him.

I said I was and shook the thin but firm hand that he offered. I forget his name and call now, but he mentioned them.

"Came across your articles a while back. Reminded me a lot of the good old days when I used to be a radio amateur. Things sure have changed since then and a lot bothers me about the changes. Things you write about low power lead me to believe that the old hamming spirit isn't dead like I figured. That's why I stopped by -- just wanted to more or less see for myself if that's so."

I didn't quite catch his drift, and when I explained that the QRPp trend was a new thing in amateur radio and that it was making hamming a great experience for quite a few hams, he continued in the same soft voice.

"That's just it, young feller, there's nothing new about doing it with low power and getting great satisfaction out of it. Nothing new at all. That challenge and adventure and satisfaction that you write about is what made ham radio what it was in the good old days."

He leaned back, pulled out a corncob, and while he filled it from an old leather pouch, crickets filled the quiet night air with their chatter. I got a better look at him in the flickering light of the match with which he lit up. There were a few smooth wrinkles, but his face had a sad, far-away look about it. He puffed the corncob to an orange glow, and then went on.

"You haven't been around long enough to remember what it was like back then. Probably never even seen a spark-gap." (I nodded affirmatively). *"Back then, I mean when tubes first came in and CW transmitters and regens opened up whole new worlds to the ham, technology and knowledge were in an infant state. All we had were '10's, 199's, and 201-A's for tubes. You really had to sock the voltage to 'em to get ten watts out. We didn't have quads and yagis either -- they were just ideas waiting to be born. You fellers work DX on 15 meters and are proud of it; heck, we didn't even know that radio waves propagated on wavelengths that short! First it was 200 meters, then 150, then 80, and then on down. That's where we worked our DX."*

He looked up at the moon through the branches of that tree out in the front yard and pulled a few times on the corncob. I didn't have the slightest idea of what 201-A was, or that you could work anything on 200 meters, but I acted like I was right with him.

"The point is, young feller, with the technology and knowledge that existed then, ham radio boiled down to one basic factor -- the man at the key. He was the important factor in every new contact, in every new step into the unknown territory below 200 meters. He didn't know whether his signal would get out of the back yard on 80 meters, but he sat at the rig night after night, listening and calling long and hard until someone came back to him. Before you knew, a whole bunch followed him down there and joined the effort to discover what was possible. That's the spirit of the thing that I'm talking about."

I sat there trying to imagine what it was like to be a ham in those days. That they were using low power and making contacts with it didn't really impress me that much. I've been doing the same for years. I guess what really got me was the business of daring to open up new parts of the frequency spectrum that perhaps the experts said were useless. And I could really feel at home with what he was saying about the man at the key.

"By gosh, when I open up a ham magazine these days -- something I rarely do because of what I find there -- I ask myself: Is this what we all had in mind when we reached out into the unknown? Where is all the courage we depended on? Where is the individual effort now? Why, I look at the pictures of these fancy so-called 'shacks' and see nothing but shiny gadgets and transceivers. And dam't, tell me straight, do they all got KW linears except you QRPp fellers? Then I find out that the fellers have to send 'em back to the factory when something goes wrong. There's something wrong if that's the case. We built our own, and we had to fix it if something went wrong. And what about all these gadgets that keep pushing the man at the key farther out of the picture? Programmed keyers that automatically send out a selected message, contesters that do everything down to writing the log on a computer print-out sheet. Is that all that ham radio is these days?"

I mentioned that these things are all advancements in communications technology and essential to the progress of the hobby.

"Hogwash", he replied with a growing agitation in his voice. *"What kind of progress is it that moves the human being who is supposed to be communicating right out of the picture? Where's the communication? Hell's bells, where does it all lead to? Think of it. Before you know it, there won't be any hams anymore, just a bunch of technicians who turn on a fully automated station and turn it loose to make 1400 contacts per hour exchanging programmed information with other fully automated stations and printing it all out on the log sheet! No sir, somehow all this progress seems to be leading amateur radio farther away from what it used to be in the early days. It just don't seem very 'amateur' anymore, judging from what I see in the magazines."*

I was beginning to get an idea of what he was driving at. But I went ahead and noted that as technology and knowledge of radio communications advances, so must the ham. The modern ham couldn't be expected to use the equipment of the 1930's when the world has moved along.

"Now, don't get me wrong. Didn't mean to imply any such thing. Far from it. But it looks to me the world has moved along and left behind your typical amateur if he can't even fix his own gear. What good has been achieved by your progress in knowledge and technology if a feller has to send the rig back to the factory first time anything goes wrong with it? It sure seems to me that either the world ought to get backward or the ham forward in such a case. That's what I'm talking about. Now, you take some of those things you write about in your articles. Fr'instance, that the QRPp man offsets his power disadvantage through skill and his knowledge of propagation and such things. Now that's what I call the same spirit as we had in the old days. Only difference is that we had no choice in the matter of how much power we were running. It was take it or leave it. But you look at the situation today. Any wonder why a situation exists where a man has to know only next to nothing to get

on the air and make contacts. A man has only to plunk down a couple hundred dollars at two bits per watt, hook up an antenna, which he also plunked down for, and he's pumping more r.f. into the ether than we ever dreamed of -- or cared about for that matter. Why, if you want my opinion, the F.C.C. ought to require every ham to demonstrate his ability to build the piece of gear that gets him on the air. You look at the Novices today. Was a good idea when they started that class back in the 1950's. If I recall rightly, most of them built their rigs from scratch, or at least from a kit. But that's all past. From the looks of it, seems like the new Novice is going to be able to run 250 watts, which will mean the end of any real need on his part to learn something about skills and what makes a radio wave go from one place to another."

We talked long into the night before he tapped his corncob gently on the step and stood up kind of slowly, as if it were a real effort. I suppose it was. He said that he'd better be getting along as it was too late for an old man such as himself to be out galavanting around. I remember quite clearly his parting words. He said something that made me feel that somehow despite the years separating us we were looking at the world through the same pair of glasses.

After shaking my hand, he spoke in a voice that sounded like it was coming across many years: *"You QRPp fellers, you keep at it. You're onto the real thing and you won't lose sight of it as long as you remember the most important thing -- the man at the key. Let the rest of 'em depend on KW's -- you stick to your guns and take yer licks but make the man at the key count most."*

With that, he turned down the walk and slowly disappeared into the darkness. Whenever things are quiet and I'm out on the steps thinking about ham radio, every now and then I fancy that I hear those slow steps with the tapping of the cane. I haven't seen him since, and probably won't again. But as I remember things that we talked about, I'll pass them along....

Chapter 2
Prologue to Exploration: The Unknowns

The idea for the story about the Old Man's visit came from rummaging through old radio magzines like *QST, Radio Broadcast, The Wireless Age,* and *Radio.* What surprised me was that QRP isn't a new approach to hamming at all. In fact, it has been a conscious preference of a portion of the amateur population from the very beginning. I was astounded to discover that in the early 1920's, QRP was attracting adherents and generating publicity in the magazines, as well as on the air. I was surprised also that even back then, there appeared to be a split among amateurs as to which route to follow -- QRP or high power, and the viewpoints advanced by the low power advocates were the same as those voiced today. Rather than merely pointing out the numerous spiritual ties which connect modern low power operators with their early precursors, I believe that we can all the more clearly perceive that connection by examining our beginnings in the QRP activity of the early days. I suspect that there is much to be learned about the spirit of amateur radio from this approach.

I. From Spark to C.W. -- The Vacuum Tube

"...the determination to possess a reliable and practical C.W. transmitting set..."

The story began after the end to World War I resulted in a removal of the ban on operating amateur transmitting installations. Although amateurs were still in the spark age, exposure to tube c.w. equipment in the military created the desire among amateurs to move in the direction of the new technology. As one writer of the period noted, "Young and Old America held fixedly to the determination to possess a reliable and practical C.W. transmitting set." J.O. Smith's (2ZL) article "Amateur C.W. transmission: Its Development and Use by Amateurs Described by One Who Has Had a Part in It" (*The Wireless Age,* January, 1921), surveyed the developments to that time, and offered practical circuits as well as operating hints. His article provides insight into the prospects faced by radio amateurs on the brink of the modern vacuum tube, shortwave era in radio communications.

In reviewing the development of vacuum tube c.w. in amateur circles, Smith recounted some of the obstacles which faced the amateur of 1920, among which the 'expert opinions' of sceptics is included: "*Some obstacles had first to be overcome, however. It was, for example, not easy to secure the means of generating undamped waves (continuous waves), aside from the important fact that continuous waves of short wave lengths [i.e., below 250 meters in 1920] were declared by many to be impractical; it was believed that the slightest change in the characteristics of the transmitter or the transmitting antenna would cause audibility changes that would make successful reception impossible.*" The empirical basis for the attitude noted in the final sentence is clarified in another article in the same issue of *The Wireless Age.* In his "Efficient Design of Regenerative and Amplifier Circuits", G.N. Garrison surveyed the design and operational parameters of the 'ultraudion' circuit and noted that, while this type of circuit is excellent for longwave work, it is very impractical for shortwave work "for the very simple reason that its degree of regeneration is not easily controlled." This problem would be partially eliminated by amateur ingenuity as the movement into the shortwaves occurred a few years later.

Following the conclusion of the war, amateurs ignored the sceptics and began development of amateur c.w., and Smith described those early pioneers in fitting

terms: "*The brains, energy, and perseverance which is part of the equipment of a successful amateur then were brought to bear on what might have proven a tough proposition to any other class of human beings. And so the world went on, with more than one enthusiast losing more hours of sleep than could otherwise be contributed by an average person who cherishes the desire to continue to live.*" Many of us who entered the field of solid-state transmitting during the 1960's can certainly identify with the experience that Smith described, for pioneers usually are required to expend great amounts of time and effort just to 'get it to work'. The scramble by amateurs to produce working c.w. gear resulted in "numberless types and specimens of C.W. outfits now in use by amateurs" remarked Smith. The ingenuity expended in the effort was obvious in the diversity of circuits that were conjured up, and Smith described the range: "It would be practically impossible to find two that looked as though they were even distantly related. But the important thing is, they work." Apparently Smith had personal knowledge of circuit diversity because of a deluge of submissions of designs resulting from his earlier query in the magazine: "*Early attempts to secure reliable information on C.W. sets, brought to the writer, a crop totalling something like seventy-five different circuits, every single one of which landed in the waste basket after many weary hours of wasted trial and effort.*" The amateur of 1920 had to be an experimenter, fiddling endlessly with any circuit which offered the slightest promise of success or of improvement over existing circuits. That was part of the problem -- there were very few existing circuits, as the technology was veritably in its infancy. Further, there were no commercial transmitters on the amateur market; in fact, amateurs had difficulty acquiring tubes and parts, a difficulty which apparently persisted until about 1925, when both RCA and Cunningham announced in *QST* that they were initiating a policy of providing tubes directly to the amateur.

The difficulties of going the solid-state route in the 1960's were markedly similar -- lack of tight quality control and lack of parts availability rendered homebrew duplication of circuits a 'chancey' proposition. Smith and his fellow pioneers had much more of a problem, though, since commercial parts were scarce and very costly. The amateur was forced to build many of the components, and articles appeared as late as 1926 showing amateurs how to homebrew such items as r.f. chokes, variable condensers (capacitors), fixed condensers, as well as other components. With regard to the parts procurement problem, Smith's list is revealing: "a source of plate potential, *some kind of tube,* a homemade coil or two, and what other miscellaneous junk could be begged, borrowed, or otherwise secured." There weren't many tubes to choose from then, so the rather vague reference to "some kind of tube" is actually indicative of the state of circuitry appearing in the literature, where a specific tube type was rarely indicated, with most articles simply listing 'V.T.' as if any would do the job! Small wonder that the duplication of the circuits submitted to Smith resulted in failure!

The transmitters shown by Smith are simple circuits operating in three c.w. modes: buzzer modulated, tonewheel modulated, and microphone modulated. In a typical circuit shown in the article, a microphone, buzzer, or tonewheel is inserted directly in the negative high voltage lead to the filament. Further, one very common method of providing high voltage is shown in which an a.c. motor drives a d.c. generator, which then feeds the tube. Smith comments that these methods of modulating the c.w. signal produce "only the slightest deflection of the space millimeter", but that "actual experience has shown that this method of modulation has great carrying power, and further, does not cause the slightest voice distortion." The tubes used in the circuit were 5-watt types operated with 400 volts on the plate. The three tube version developed 1.5 amperes r.f. current into an antenna exhibiting an 8 Ohms input resistance. While this represents an r.f. output of about 18 watts, it should be borne in mind that at the time, anten-

nas in use consisted of a 'skywire counterpoise' system tapped directly onto the tuned circuit inductance. In all probability, much of the r.f. output consisted of harmonic energy and parasitics. Later in the decade, the ARRL continuously urged amateurs to employ wavemeters to tune their transmitters to insure that the r.f. output was on the desired frequency. In the same issue that Smith's article appeared, in fact, one manufacturer of wavemeters advertised his instrument as a sure means of determining whether "the energy radiated by your set is concentrated in a single sharp wave of great intensity or spread over a broad band of wave-lengths where it causes QRM and reduces your range."

In terms of the success of the above circuit, Smith indicated that one unit running 50 watts input, located on Long Island, covered remarkable distances, with contacts and reports of reception as far away as Michigan, Missouri, Florida, and Ohio. The unit operated at about 275 meters (about 1 MHz)! Smith was fascinated with one feature of his experiments with c.w. He related that "*a test conducted with a spark station in Columbus, OH, developed the highly interesting fact that the signals of the C.W. unit were reported at Columbus as being steadier and stronger than the signals from a well-tuned 1kW (spark) transmitter at the same eastern station.*" As yet, spark was the dominant transmission mode used by amateurs, and would not be outlawed until mid-1924.

At this early date and well into the decade, the ability to transmit, or to make two-way contact, was not reliable enough to limit magazine reports to contacts only. In early 1925, in fact, *QST* announced its intention of discontinuing its 'Calls Heard' section, and provoked so widespread a protest that it was forced to reinstitute the section three months later! (And it was retained until the late 1930's) *2ZL* provided such a list in the same issue of *The Wireless Age* covering the October to November, 1920 period. He reported 65 stations heard, 16 worked on c.w. during October, and 74 stations heard, 15 worked during November. In addition, several contacts were made with phone operation. The listed stations represent the 1, 2, 3, 4, 8, and 9 call districts. Note the low called vs worked ratio!

The big story of the January issue was the first transatlantic voice transmission by Hugh Robinson, *2QR*, whose station photo graced the cover of the issue. The write-up heralded the feat in unmistakable terms: "*The long-time dream of the amateur has been realized. Trans-ocean radio from America to Europe is now a* fact." *2QR*'s transmissions, typical of experimenters of the time, consisted of the description of his equipment, location, and other data, followed by a hit-record *Roamin in the Gloamin,* and were received by George W.G. Benzie of Aberdeenshire, Scotland. Mr. Benzie's letter reporting the reception was included in the article. At the time, *2QR* was running 100 watts input, which the reporter described as 'low power', on 280 meters! The antenna consisted of six equal length (unspecified) wires at a height of 60ft above ground. As we look back across the years, we can agree with the reporter's sense of amazement at this feat, but for very different reasons. That such a contact occurred in the middle of our present broadcast band is indeed remarkable! *2QR*'s success was the impetus for the America to Scotland transmission tests conducted by the ARRL in 1921, which resulted in the reception of 32 U.S. amateur stations by listeners in Scotland. The radio amateur of the day led the way in demonstrating what was possible in radio. The results of amateur experimentation and exploration of c.w. and the shortwaves determined the direction of radio in the modern era.

It wasn't long before amateur radio turned from spark transmitter to vacuum tube sets and began the movement downward in frequency from the then-standard longwaves above 200 meters. The ARRL led the movement, and one issue of *QST* in early 1921 emphasized the new direction, with the cover listing feature articles about c.w. transmission, vacuum tube circuits, regenerative re-

ceivers, radiotelephony, and loop antennas. Amateurs were to be credited during the decade with many major advances in technology and knowledge.

At the beginning of the decade, though, amateur activity for the most part was limited to low power levels as far as c.w. tube gear was concerned. The tubes that were available at the time placed a real power limitation upon transmitting gear. Receiving tubes such as the UV199, UV200, and UV201 were pressed into transmitting service, although primarily intended for receiver detector and audio amplifier applications. These tubes were first advertised in late 1920 by several companies, including Cunningham-Audiotron, RCA, and General Electric. An Atlantic Radio Co. ad of the period noted that the UV200 "has been especially designed to meet the requirements of the amateur and experimental field, viz: the production of a tube which would prove a sensitive detector and a superior amplifier, and which could be operated off of a single standard 22.5-volt battery." A low-vacuum, gas-content tube, the UV200 was heralded for its low B+ requirement, and advertised as a "free and persistent oscillator for regenerative amplification and CW reception".

The 201 was a high-vacuum type, permitting use of higher B+ level to about 100 volts, with the filament powered directly from a 6-volt d.c. source. Amateurs ignored manufacturer's ratings when transmitting was involved, and these tubes were run with as much as 600 volts on the plate! Compared to modern tubes, these early devices were fairly primitive. In the case of the 199, for example, the transconductance was 425 micromhos with an amplification factor of 6.6, with the 200 and 201 showing similar specifications. In comparison, a modern 6C4 triode exhibits a transconductance of 220 micromhos and an amplification factor of 17! The feature that made these tubes especially important to amateur application was their low filament-voltage requirement, since a satisfactory technique of supplying filament power from an a.c. source had not yet been devised. The 199 required a filament source of about 63 ma. at a nominal 3.3 volts, which could be supplied easily by a 4.5-volt cell through a series potentiometer for several weeks operation. That these tubes could be operated from battery supplies added to their impact upon amateur use: they brought tube operation within the reach of every amateur. The General Electric UV202 transmitting tube appeared early in the decade. It was rated at a minimum output capability of 5 watts, but required 7.5 volts at 2 amps for its tungsten filament! Oldtimers recall that they could almost read a book by the light of its filament. Prices for the new tubes were high -- $6.00 to $8.00, which was a considerable amount of money in those days. By 1925, mass-production brought the UV202 price down to $4.00, and it was an extremely popular tube among beginners and veterans alike.

Amateur ingenuity devised a means of cutting tube costs by pressing tubes discarded from receivers into transmitting service. In receiver applications, sensitivity and noise factor were a concern then as now, and the gas-content tube suffered electrode deterioration quickly because heating led to chemical transformations. In his story "QRP In the Good Old Days", published in *The Milliwatt* (June, 1973), Brice Anderson (W9PNE) related his early experience with this approach to using discarded receiver tubes in transmitting gear: "*One thing that fascinated me in those early days was the procedure my Dad used to 'harden' 201A tubes for transmitter service. A trip to the local radio service shop could easily net a basketful of used 201A tubes. These tubes were all quite weak in a receiver. However, about five minutes service in the oscillator with 7.5 volts on the filament and a plate voltage of 600 volts would harden the tube. If it survived the test, the tube could then be used in the transmitter with a plate voltage of from 300-600 volts at a plate current of about 25 ma. It was necessary to keep the filament voltage at about 7.5 volts. The durability of those 201A's was amazing. I knew of one pair that gave well over a year's service in the transmitter.*" Power input to such a transmitter was

typically in a range extending to 20 watts, with r.f. output typically in the QRP range. Interestingly enough, this hardening process endured until as late as 1930, when in the February issue of *QST,* the study questions for the license examination read: "*Q. 42.* State the proper procedure to follow in reactivating a 201-A tube. *A. 42.* A 201-A tube may be reactivated by operating the filament at 18 volts for one second, after which the filament should be 'aged' by operating the filament for from 5 to 7 minutes." Presumably, tube quality had improved by this time.

One major technical problem facing the early tube transmitter was a source of B+ for the plate, as Smith noted above. While magazine ads offered extremely-high voltage, low current transformers for spark transmitters, none appeared which were capable of providing the relatively low voltages and currents required for a tube c.w. transmitter. Various schemes, including the d.c. generator driven by an a.c. motor, were used to provide B+ for tube gear. Most frequently, wet-cell batteries or raw a.c. were the major source of B+ voltage. The battery powered rigs of the 1920's were by no means ancestors of today's subminiature battery powered portable transmitter! The typical wet-cell producing 1.4-2.0 volts was 'homebrewed' by preparing a large batch of electrolyte solution, and then filling a selected number of canning jars with it. The individual cells were then connected in series. Considering that the voltage desired ranged up to 600 volts, it is not difficult to imagine the space occupied by such a power source! Photos of the period showed vast arrays of canning jars, and W9PNE recalls of his father's transmitting power source: "*It [the transmitter] had an unusually stable and pure D.C. note, as the plate voltage was supplied by a bank of homemade storage cells connected in series. We had 600 volts available, but usually used from 300-400 volts. A good portion of the basement was taken over by the expanse of batteries.*" Photos from the period showing arrays of storage batteries verify the accuracy of W9PNE's description.

As the decade progressed, crudely filtered a.c. supplies were devised which, when used to power a c.w. rig, produced c.w. signals with T6-T7 notes, listed as 'filtered a.c.' in various places. One of the a.c. supplies that found wide acceptance in the early 1920's relied upon a standard Model-T Ford ignition coil, and was described in a 1921 *QST.* When the key was closed, the 12 volts across the spark-coil built up to a high voltage before the contacts opened and discharged the inductance across the output terminals. This output, consisting of 'spikes', was crudely filtered by a homebrew 'sending condenser' and placed directly upon the plates of the tube without further filtering! Needless to say, signal purity from such a transmitter was akin to the QRM generated by a small a.c. appliance such as a hairdryer. By 1925, the purity of amateur signals became an ARRL concern, and *QST* became increasingly vociferous on the subject. An amusing 'Stray' appeared in the August, 1925, issue on the subject: "*Flivver coil I.C.W. is attractively economical but not so good. Ford never taught his coils to be musicians.*" A circuit powered by the 'flivver coil' system was very inefficient. C.F. Rockey (W9SCH) speculated that such a circuit probably consumed about 20 watts with about 5 watts actually developed as r.f. output, of which a considerable portion could consist of harmonic radiation. In his comments in the 1924 'Low Power Report', L.W. Hatry made a similar point (see Chapter 3). In any event, it seems likely that these 'flivver coil' transmitters exhibited on- frequency outputs easily within the 5-watt QRP range, even when total input was on the order of 30-40 watts.

Apparently operating such crude equipment was difficult and a definite hindrance to successful two-way contacts. Recall the low called vs worked ratio in the list given by Smith above. The typical method of connecting the transmission line to a transmitter was via a direct tap upon the oscillator inductance which, of course, controlled the transmitter frequency. Matching was accomplished by

readjusting the tap-positions for maximum antenna current. Obviously, this 'conductive coupling' method had its drawbacks in view of the fact that moving the tap inevitably moved the frequency! Further, the changes in antenna impedance occasioned by the swaying of an antenna in a light breeze had the same effect. Reception was also a matter of some difficulty. In his introduction to amateur c.w., Smith provided tuning hints with regard to receiving c.w. signals: "*The usual and easiest way of exploring for straight C.W. signals is to bring the receiving tube into oscillation, with about 50 percent coupling between primary and secondary (coils), and then tune slowly over a wide range of wavelengths by means of the secondary variometer [i.e., variable inductances]. Once a c.w. signal is located, the antenna condenser (capacitor) is brought into resonance, and the plate variometer adjusted to the dead point, which indicates resonance of all circuits. Variation of the coupling will then give any beat note desired.*" At best, operating such a receiver was a rather complicated and time consuming process. By the time a receiving station managed to tune in a *CQ* and then tune his transmitter in similar manner to the *CQ*er's frequency, the *CQ*'er could have already quit and gone to bed, convinced that he hadn't been heard!

The foundation of the amateur movement into the modern era was crude and primitive in 1920. The old coexisted with the untried new. Radio work at the University of Illinois amateur installation was reported by Jas. B. Holston in the January, 1921, issue of *The Wireless Age*. He remarked: "It is hoped that one of the new seventy-five meter CW sets will be available for study and use, as well as other new equipment, for the coming season." His reference to the 75 meter set is puzzling, since amateurs were not allocated this band until mid-1924. But the old still remained the tried and proven approach: "A complete shortwave transmitting and receiving set will be in operation both on the new 250 meter wave allowed amateurs and the longer waves allowed us with a special license." The spark station remained in operation as well.

II. Exploring Unknown Territory: The Shortwaves

"It is impossible to say what will be found there
and no guess is too wild..."

Following the introduction of the vacuum tube to the general amateur population and the popularization of the c.w. mode, amateur radio became the vanguard of exploration into the unknown 'shortwave' spectrum during the first half of the decade. From about 1923 onward, technological progress and discoveries became dated in weeks and months rather than years, and the amateur operator was the pioneer. For the most part, he was a very special type of operator -- a QRP operator! Eventually crowded out of the longwave spectrum above 200 meters by encroaching commercial broadcasters, the amateur was "exiled" to the shortwaves below 200 meters "that had once been thought useless" as a writer in 1925 remarked. It was a fortunate banishment, for it produced the great break-throughs in the science of radio that were needed for its continued development.

Equipped with low power, single tube oscillator transmitters and single tube regenerative detectors with perhaps one stage of audio amplification, the amateur was forced to improvise to meet the demands of the unknown, to persevere in the face of predicted failure. The spirit of the amateur in this enterprise can be expressed in no better terms than those used by K. B. Warner, the Editor of *QST,* in the March, 1924 issue. After reviewing the progress made by amateurs in demonstrating the usefulness of the shortwaves, he turned to future spectrum allocations soon to be considered by the government, and reflected: "*Those waves do need developing, and we're the crowd to do it. Wouldn't it be fascinating to have an amateur band from 40 to 50 meters or even from 4 to 5 meters, where*

we'd have to develop totally new methods and brand new apparatus to make them work? Real pioneering development, contributing something new to the art! And 70 to 90 meters or 110 to 125 meters, some band where our present knowledge will apply but still 'short' waves as we know them today!" The exciting prospect of being forced by circumstances to develop new equipment and techniques obviously undergirds the Editor's exhortation -- that is the essence of amateur radio in his opinion. At the time he wrote, only a few special three-month experimental 'X' licenses had been issued to amateurs for operation below 150 meters (current allocation of 150-200 meters).

John Reinartz (*1XAM*) was a holder of one such special license, and he was the first American amateur to bridge the Atlantic in two-way communication. The historic event took place on November 17, 1923, when *1XAM* and then *1MO* worked *f8AB* on about 105 meters. While *f8AB,* holder of a special high power French license, was running a kilowatt input from Nice, France, both American amateurs were putting less than 100 watts into their antennas. A series of subsequent tests proved that the transatlantic work could be done reliably. The impact of their success was noted in "Transatlantic Amateur Communication Accomplished" in the January, 1924, issue of *QST* in these terms: "*For years we have dreamed of this; for over a year we have seen it coming; for weeks we have been sure that winter weather would see the thing accomplished. It has been done, fellows; we are actually in back and forth contact with Europe over our amateur sets. For the first time in history we have worked a European amateur, and for the first time the amateurs of distant foreign countries have sat by their respective firesides and talked to each other with ease.*" Americans had been heard both across the Pacific and the Atlantic, and ironically, in this first great transoceanic contact, the DX station was the one running the real high power! This would be the last DX accomplishment in which the tables were turned. Amateurs on both sides of the Atlantic geared up to duplicate the *1XAM-f8AB* work, but as yet, they were forced to remain above 150 meters by regulations. Once the lower bands were opened to amateur activity later in the year, the great migration downward into the shortwaves that changed the world of radio would begin.

Knowledge of the shortwaves emerged rather slowly. Even a year and a half later, Keith Henney, Director of the Radio Laboratory of *Radio Broadcast*, would write: "*Adventuring into the radio region below about 1500 kilocycles (kilohertz) is like exploring unknown territory. It is impossible to say what will be found there and no guess is too wild. From this frequency (200 meters), 1499 kilocycles to be exact, down to goodness knows where, is a region so vast that all existing stations could be placed in it without crowding. 'DX' exists there that is undreamed of on the longer waves, and it is a territory into which anyone may venture with the certainty that he will discover interesting things*" (*Radio Broadcast,* hereafter simply *RB,* October, 1925). Indeed! By the time Henney wrote, in fact, low power operators had been repeatedly astounding the radio world with phenomenal very low power exploits that stretched the imagination.

The movement of amateurs into the shortwaves was indeed an expedition of discovery. The entire spectrum below 200 meters was an uncharted region, a total mystery to the radio world. Virtually no theory existed in 1923 to explain the propagation of radio signals below 200 meters, and what theory did exist was basically wrong. In fact, it is difficult to imagine how ignorant they were of propagation at the time. Amateur work from late 1923 onward finally began to produce results in the form of propagation theory by early 1925. John L. Reinartz (*1XAM*) provided both experimental observations, through his on-the-air work, and the genius to mold his data into a theory which appeared in "Reflection of Short Waves" (*QST,* April, 1925), his first paper on the subject. Previous to the appearance of this paper, the Kennelly-Heaviside Layer theory had been general-

ly accepted because it was unchallenged by any kinds of observations that were possible on the longwaves. The Kennelly-Heaviside view attributed all propagation of radio signals to the existence of an intensely ionized stratum of rarified air at the auroral level height of about 100km which reflected radio waves, as would a mirror with regard to light waves. The major drawback to the theory was that the ion density required for such reflections to occur at shortwave frequencies greatly exceeded upper atmosphere density. Eccles and Larmor modified the theory to replace the reflection mechanics with refraction, in which the radio signals are bent back toward the earth rather than perfectly reflected, and Nichols and Schelling then added the factor of the earth's geomagnetic field. However, even though the original theory as modified by later scientists made logical sense, it had one serious empirical flaw -- an almost total lack of data regarding radio signal behavior in the shortwave spectrum where, as we now know, propagation phenomena are most noticeable.

Reinartz and his fellow experimenters provided the needed empirical data and revolutionized the world's understanding of propagation. First experimenting at around 100 meters, and then on 20 meters during late 1924, Reinartz introduced the real causitive factor in propagation as we know it today -- solar radiation. In his landmark article noted above, Reinartz isolated the parameters of the effects of solar radiation and illustrated his theory with numerous drawings, many of which would be relatively current today. He perceived the relationship between the position of the sun and angle of incidence of arriving radiation occurring daily and seasonally, and noted the effect of those factors upon frequency. H. A. Joyer added to Reinartz's concept in the July, 1925, issue of *QST* in "How Are Short Waves Reflected?" which was followed by a lengthy study by Dr. E. O. Hulbert and Dr. A. Hoyt Taylor (Reinartz's colleague in 1924 experiments) entitled "Wave Propagation at High Frequencies" (October, 1925, pp. 12-21).

In that study, Taylor and Hulbert brought modern propagation theory into being, correctly assessing such matters as upper atmosphere ionization and deionization incident upon solar radiation, ionospheric loss and absorption, multiple skip propagation, and the effects of frequency upon absorption rates. The authors admitted that many of their suggestions were speculative, lacking the foundation of truly exhaustive data, but in fact, they were accurate on many points and must be credited with introducing radically new concepts. They worked from experimental data which was collected during a voyage of the *U.S.S. St. Mihiel* from New York to Panama and focused on an analysis of the nature of the 'skipped distance' which emerged in the data. A direct correlation between skip distance and frequency varying from 150 miles at 7.5 MHz to 1400 miles at 25 MHz led to a theoretical estimate of the ion density required to cause the variation: their figure of 5.57×10^5 electrons per cubic centimeter and a virtual height of reflection at 185 miles agrees closely with modern data. Similarly, their method of employing the refractive index of the ionospheric medium to correlate wave frequency, critical angle of incidence, and skip distance as the *MUF* (maximum usable frequency) is decidedly modern. But without the data provided by ionospheric sounders about electron density vs altitude, Taylor and Hulbert were in the dark with respect to the actual ray paths traversed at different frequencies during varying diurnal and seasonal conditions. Hence, they were forced to speculate as to whether ray paths curved parabolically, eliptically, sinusoidally, logarithmically or at a sharp angle, and presented optional heights of refraction for each case and the experimental data. Furthermore, their observations about diurnal and seasonal variations in the *MUF* were skewed by their lack of knowledge about electron density vs height for these periods. Nonetheless, Taylor and Hulbert's paper represents a major step in propagation theory and is well worth reading even today. Significantly, the first mathematical analysis of propagation

phenomena would not appear in the *Proceedings of the Institute of Radio Engineers* until almost a year later -- pioneering radio amateurs discovered and stated the theory first!

Alerted to the need for data, the ARRL initiated all sorts of 'tests'. Among these were the "Fading Tests" which provided data for the above authors, the "Daylight Transcons" [*transcontinentals*], "Pan American Tests", "Trans Canadian Relays", and the "Trans Pacific" and "Trans Atlantic" tests. The amateur radio world enthusiastically participated in the effort to discover the nature of the shortwaves and provided much of the empirical groundwork upon which the modern understanding of propagation is based. It must have been an exciting period for amateurs, with every other issue of *QST* heralding phenomenal new discoveries and achievements, urging participating in new tests suggested by recent findings. The radio amateur could see that he stood the chance of discovering something that would revolutionize knowledge at the time.

Verification of new theories, of course, requires time. So it was with the new theory suggested by amateur discoveries in the shortwave spectrum. It was a world in flux, to say the least. Consider, for example, the level of understanding and certainty (or lack of it!) exhibited by Keith Henney, who was familiar with all of the latest scientific developments in radio through his compilation of a monthly annotated bibliography of important articles appearing in *RB, QST, Radio, Proceedings of the I.R.E.* and other periodicals. In a word, he was abreast of the latest developments. Yet in his article "What Do We Know About the Shortwaves?" (*RB,* November, 1925), he could summarize the subject in these terms:

> *Aside from the frequency and the power used, the other factors limiting our transmissions are the time of day, the type of antenna, and nature of the country between transmitting and receiving station. At night, conditions are vastly different than during daylight ... the effect of intervening objects has not been completely investigated. Other conditions remaining theoretically the same, increasing the transmission frequency widens the radius over which signals from our station may be heard ... At the same time, we seem to find that our signals are not heard nearby, but that they take a peculiar jump and come down again at some greater distance. This view is maintained by several experimenters, notably John Reinartz, and yet remains to be proved or disproved.*

Note that Henney considered Reinartz's theory to be tentative, and more significantly, Henney called others to join with him in exploring the nature of shortwave propagation on their own, assuming that they could contribute as well as Reinartz. The article posed questions about the salient features of Reinartz's theory in an editorial 'feature box' entitled "*Some Important Radio Questions to be Answered:*"

> *-- What takes place along the high frequency bands?*
> *-- How far may one expect to carry on reliable communication in daylight, and at night, with a given amount of power and at a given frequency?*
> *-- Do signals actually 'jump over' nearby stations, to reappear at some much greater distance?*
> *-- What is the relation between time of day and distance of transmission?*
> *-- What difference do the seasons make in short wave transmission?*

Henney's interest in exploring the shortwaves was a personal one, and his purpose in writing the article was to encourage amateurs to embark on their own explorations of the shortwaves, reporting results to *RB.*

Henney recounted how he stumbled onto what appeared to be the most fascinating aspect of shortwave experimentation. Operating the *RB* amateur station *2GY* in the Fall of 1925, Henney's '50-watter' transmitter tube burned out unexpectedly and no replacement was on hand, so he substituted a '5-watter' and con-

tinued operation on 40 meters at 40 watts input. To his amazement, "the same range was obtained as with the larger tube." Like the typical amateur encountering QRP success for the first time, Henney became curious as to how far he could lower power and still maintain reliable contact, and reported extensive scheduled contacts with stations in North Carolina and Florida. Moreover, he referred to the very recent two-way work between Canadian *c9CK* and Australian *a5BG* (see Chapter 4), in stressing the need for QRP experimentation to assess the nature of propagation on the shortwaves. Two salient features about the knowledge of the shortwaves in late 1925 emerge from Henney's discussion: (1) the uncertainty of the knowledge of propagation at the time; and (2) the impression created by the article that QRP work was a major frontier in the exploration of the shortwaves. Indeed, over half of the article is devoted to a discussion of the low power work done by *2GY* under the heading in block capitals "**WHAT RELATION EXISTS BETWEEN POWER AND DISTANCE?**" The call for reports from amateurs, further, was made specifically in regard to low power work. Henney's identification of the QRP operator as one of the foremost explorers was not uncommon -- in fact, Henney was a 'johnny come lately', for that identification had been forcefully made almost two years earlier. Similarly, Henney's closing exhortation encouraging readers to submit low power reports to *RB* was just as late. But obviously, we've moved far ahead of the real QRP story's beginnings as we've summarized the state of knowledge (or ignorance) of propagation phenomena as it existed in 1923 when the amateur radio world stood on the brink of the movement into the shortwave spectrum.

The lack of knowledge about propagation was not the only obstacle to the pioneering efforts of amateurs -- the technology of the day was quite primitive, and although no 'great advancements' were to be made in the next few years, the design, construction, and operation of c.w. tube equipment required considerable refinement if success in the shortwave exploration was to occur, as the Editorial in the March, 1924, *QST* noted above clearly implied. Beginning in mid-1923, *QST* carried an increasing number of primary articles on basic electronics as related to the amateur. The impressive feature of these appearances is that they represent an entirely new perspective for the amateur operator, and include basic information and design theory that we take for granted today. A brief summary of the *QST* material will provide a valuable insight into the state of technology at the time.

The vacuum tube itself was a primary focus and required explanations of a very basic nature. The operation of tubes appears to have been only partially understood by the majority of amateurs. *QST* carried four major articles about tubes between August, 1923, and April, 1924, dealing with internal and external operating characteristics, as well as discussions of matters such as selection and construction of the 'grid leak' resistor. The proper operating conditions dependent upon that single item were a matter of great concern! Simple matters such as the measurement of a.c. and d.c. input required explanation. The amateur practice of the day seems to have left much to be desired in the way of technical sophistication. One interesting letter to the editor in the October, 1923, issue berated amateurs on that point. Morris Preston (*2MB*) wrote: *"I can't understand why so many fellows insist that they are using 5 watts when they don't know what 5 watts means,"* and continued by criticizing the 'watts per mile' records claimed by the new wave of c.w. operators. He advised: *"if a fellow asks you how much power you are using, don't tell him a 'five watter' [tube]. It means nothing"*, citing as an example the 5-watter at *2MB* which operated at an input of 18 watts with an output of "5 watts of pure C.W". Statements about distance records, in *2MB*'s opinion, required actual measurement of either input or output power, rather than statements of tube power-ratings.

2MB's point was taken up with a vengeance by *QST* Technical Editor, Robert S. Kruse (*1XAQ*) in the next issue with the strongly argued article "What Power Have You? -- Unscrambling the Power Rating of Your Set". Kruse was highly critical of the apparent ignorance of many amateurs: "*We are constantly receiving letters [at ARRL headquarters] that say 'I am using 5 watts and putting 1.5 amps into the antenna.' Buncomb -- the thing can't be done; that amount of current represents about 30 watts in the average antenna.*" Kruse pointed out that no relation exists between the tube rating and actual input power. Tube rating is simply the manufacturer's minimum output rating for a given tube, established by operating the tube with "low plate voltage and with everything out of adjustment". The article was an attempt to clarify three parameters as they relate to amateur practice: (1) manufacturer's tube rating; (2) normal input power operating conditions; and (3) safe plate dissipation. Several examples were used which are informative of then-current practice. Kruse cited an instance of a particular operator who used six '5-watters' in his transmitter: "*The owner of this layout had been telling us what wonderful work he was doing with a 'dinky little 30 watts.' Wonder how he accounted for the wild dive all the lights in the place took every time the 'dinky 30 watt' load came on? As a matter of fact the set drew 480 watts in the plate circuit*" producing an output of 390 watts! Kruse reiterated *2MB's* point: "Evidently our method of tube rating means exactly nothing." Based upon his experience with various amateur installations, he remarked that "*the average amateur tube station is using from 5 to 12 times the power that one would think, if one judged by the tube ratings.*" The logical conclusion, then, was that "*the way to rate a tube station is NOT by what the labels on the tube boxes say but by the actual input to the plates of the tubes.*" The input power approach is demanded by circumstances, since "it is too hard to measure the output of the set."

In his discussion, though, Kruse placed the major emphasis upon transmitter efficiency, or the ratio of input to output power, and one would suspect that he would have welcomed widespread capability to measure output powers as a basis of comparing station performance. Efficiency is shown to depend upon proper adjustment of operating parameters, and in one example using a 'VT-2' tube rated at '5 watts', Kruse explained that the efficiency of the tube at low input and out of adjustment can be raised from 25%-33%, and then by increasing the input to 40 watts and readjusting, the efficiency could be raised to 75%. The desired effect of Kruse's strongly argued piece was to correct a serious flaw in amateur practice by stressing an efficiency oriented approach to tube station power rating. His sense of frustration with current practice is very evident throughout his discussion. However, amateurs apparently responded very slowly in regard to efficiency. Finally, to encourage amateurs to give greater concern to efficiency, Kruse initiated the 'Station Efficiency Contest' in the same issue of *QST* and unwittingly began the QRP movement in the U.S., as we'll see later.

The April, 1924 issue followed up Kruse's discussion with a detailed article about a method of measuring tube input and output in "Seeing What Your Tubes Are Doing" by H. J. Nolte of the General Electric Research Laboratory. The technique devised by Nolte involved a visual comparison of the glow of the tube anode with filament glow in a Mazda lamp whose d.c. input was accurately metered. The device used was termed a 'pyrometer' and functioned upon the principle that plate glow results from the total power input not consumed in the grid-leak resistance and antenna circuit. Hence, after measuring plate dissipation in a non-oscillating state, that measurement can be subtracted from known plate input to give plate output. Nolte's article went into exhaustive detail about the theory and application of this approach. Like Kruse, he stressed the utmost importance of the concept of efficiency.

Then, as now, the terms 'efficiency' and 'low loss' were linked with excellence in the design and construction of amateur equipment, so much so, in fact, that annual indexes to *QST*'s of the period use 'low loss' as an indexing category along with 'transmitters', 'antenna systems' and the like. Apparently the concern for low loss design and construction began with K. E. Hassel's (*9ZN*) "Short Wave Tuner Design" (December, 1923) where he noted: "The present-day tendency in receiver design seems to be toward many stages of amplification rather than tuner efficiency." After noting that it is often difficult to detect any improvement in receiver performance when judging from an auditory comparison of 'before and after' states since a 3% change is the smallest difference detectable by ear, Hassel pointed out that in a simple set, changes can be made which eliminate several small sources of loss, resulting in an overall improvement on the order of 30%. Amateurs must trust the "laboratory and not the ear when doing development work". With respect to coil forms, for example, "Careful laboratory measurements show that ordinary paper or cardboard tube (providing it is dry), is far superior to the more expensive materials found in commercial receivers." He continued his discussion in regard to every component of a receiver, evidencing that attention to detail that came to characterize the successful low power operator in subsequent articles. Kruse described three receivers in "Low Loss Tuners" (February, 1924) built according to Hassel's principles, and went into much greater detail than Hassel. The application of the same low loss principles to transmitter design and construction was publicized in feature articles detailing phenomenal QRP work by the Australians at the time. From then on, photos of transmitters and receivers included captions which detailed the low loss approaches to construction in the featured design. Significantly, descriptions of high power transmitters during the period never made mention of the low loss approach!

As noted earlier, a high voltage source for powering the tube transmitter was a major problem facing the operator in the early 1920's. *QST* turned to solving the problem with articles about power supplies. By this time, the unquestionable superiority of the pure d.c. note over 'raw a.c.' and 'rectified a.c.' had been demonstrated on the air. The ARRL became increasingly vociferous in its attempt to rid the amateur bands of 'less than pure' d.c. notes. However, 'raw a.c.' would not be outlawed until about 1931 and would remain a problem in 1935! *QST* featured an exhaustive treatment of a.c. and r.f. filters in F. S. Dellenbaugh, Jr.'s "Electric Filters" (May, June, 1923) followed up by details on his 'brute force' power supply system. Articles followed detailing the design and construction of plate supply transformers ("Small Transformers for the Amateur", May, June, 1924), as well as filter chokes, filter capacitors, and plate r.f. chokes. Rectifiers of the time were primitive, represented by the 'S' type tube and homebrew chemical rectifiers. A preference for B-battery supplies emerged rapidly in 1924 when the exploits of QRP operators were attributed in part to the pure d.c. tone and stability of their signals.

Signal stability was a serious problem in the movement to the shortwaves from the very start. The source of the stability problem was no mystery -- changes in operating conditions such as plate or filament voltage caused a frequency shift, as well as vibrating inductances and tube elements; and the method of coupling feedline to transmitter oscillator inductance thru a direct tap on the coil led to 'wobbly' signals. It was found that operation from a battery source helped a bit, and loose inductive coupling replaced the direct tap, adding another degree of improvement. Eliminating sources of mechanical vibration removed another source. Finally, Nicholas Hagemann (*2KP*) described an electrical solution to the problem in single stage oscillator-transmitters in the January, 1926, issue of *RB*.

During 1925, the use of crystal control appeared, but getting a crystal to oscillate was a rather fussy procedure.

III. From Flat-tops and Counterpoises to Antennas

"...our antennas are all wrong!..."

The logistics operating against the success of the 1923-1927 movement into the shortwaves were formidable in regard to the state of technology at the time. Given the difficulty of operating both transmitter and receiver with their tuning procedures and serious frequency stability problems, two-way contact must have been a difficult accomplishment. Anyone who has operated with a regenerative receiver has experienced the situation to a certain degree. To make matters even worse, there existed an almost complete ignorance about antenna theory as it applies to the shortwave spectrum. Much experimentation would be necessary before the actual principles of antenna operation began to emerge with modern clarity in the late 1920's. In 1923, amateur antenna practice was based upon experience on the longwaves above 200 meters, where circumstances dictated that antennas be very short for their frequency of operation. An example of state of the art understanding of antenna principles in 1923, followed by a brief summary of developments to 1928, will enable the reader to place in an appropriate context the accomplishments of the early QRP pioneers.

Prior to mid-1923, no knowledge of antenna theory and operation based upon scientific experimentation was available to the amateur. At best, scattered observations about unexpected antenna performance appearing in notes in *QST* constituted the amateur's knowledge of the subject. Fundamental concepts such as the relationship between antenna length and frequency of operation were unsettled questions. The basic antenna system was comprised of a 'skywire' worked against an ungrounded 'counterpoise' placed upon the ground or at a height of several feet above the ground. A large loading coil in series with the two sections of the antenna was needed to tune the system to resonance. Such an arrangement resulted in a very low antenna input resistance, producing very high antenna currents for a given power level. The accepted axiom applied in practice was to adjust the system for maximum antenna current, which was assumed to indicate maximum radiated power. From a modern viewpoint, the system had to have been extremely inefficient, since the counterpoise coupled antenna power directly to lossy earth. Measurements of antenna input resistance published at the time show this to be the case, as we'll see below.

In the May, 1923, issue of *QST,* Ross Gunn, M.S. (*8ZO*), first proposed a method for determining the optimum antenna length vs. frequency ratio for maximum radiation. His approach is the modern one -- first, paper predictions based upon calculations were devised, and then tested through a series of field strength measurements under controlled conditions. As is clear from the results which Gunn obtained, his approach, although fundamentally sound, was hampered by the lack of knowledge about antenna theory at the time. Those results were published in the September, 1923 issue under the editorial header: *"At last some real information on the right size for the antenna".* In "The Best Dimensions for Amateur Antennas", Gunn stated the objective of his experiments in these terms: "to find at what wave length (frequency of operation) the maximum power is received for a given amount of power in the sending antenna." The size of the antenna, of course, remained constant, as well as the input power. His method involved carefully calibrating a primitive field strength meter across the frequency range to be tested, and then making precise measurements of received signal intensity as the transmitter frequency was varied across the 100-220 meter range. His assumption was that the maximum field strength intensity would occur

when the antenna was operated on the frequency which was optimum for its physical length.

The construction of antennas at that time consisted of two approaches, both of which permitted the use of multiple-wire radiating and counterpoise elements. In the 'flat-top' approach, several wires were spaced evenly along a six to ten foot 'spreader' and suspended horizontally from end supports; a separate feed wire dropped from each flat-top wire to a common point where the feedline entered the shack. In the 'cage' approach, a circular 'spreader' up to four feet in diameter formed the element wires into a tubular configuration suspended horizontally or vertically; the multiple wire feedline was constructed likewise as a 'cage'. The counterpoise section in simple installations consisted of a single wire, but generally more elaborate systems were used, constructed in rectangular shapes up to 100ft x 40ft. A single-wire lead-in connected the counterpoise to the transmitter.

The antenna tested by Gunn was in a 'T' configuration, cage construction, with a horizontal section of 37ft and a vertical section of 35ft, with the height of the horizontal section at 35ft. The counterpoise consisted of six 70ft wires placed upon the ground. The system was measured as resonant at 123 meters (2.4 MHz) including the loading coil inserted between skywire and counterpoise. With the above dimensions, the antenna is roughly equal to a modern base loaded 40 meter quarterwave vertical with capacity hat, operated on 160 meters! In the article, Gunn provided two curves showing input resistance vs. frequency of operation for the antenna. Measurements made with the counterpoise on the ground show an antenna input resistance of about 58 Ohms at the resonant frequency. However, a second curve charting measurements made with the counterpoise at a height of 3ft shows a resonant frequency input resistance of only 21 Ohms! The 37-Ohm difference in readings represents, of course, groundloss resistance. Gunn failed to distinguish between these two components of the measured resistance (i.e., actual antenna resistance and groundloss resistance) simply because the distinction was not understood. Instead, he noted: "An interesting point which *has no direct bearing here* is that the resistance vs wavelength curve of the sending antenna was changed from Curve A to Curve B simply by raising the counterpoise 3ft off the ground". Gunn's failure to perceive the implications of his laboriously obtained data is to be expected. In fact, Technical Editor Kruse missed the point also, commenting on Gunn's findings solely in the context of the shift of resonant frequency as the counterpoise placement is changed. It was a classic case of 'seeing what you are looking for!' In a second graph, Gunn showed the field strength measurements which led to his conclusion that the optimum radiation efficiency occurs when the antenna length is 0.456 wavelength at the operating frequency.

Kruse added the short note "Antenna Dimensions" to provide construction dimensions for amateur readers based upon Gunn's findings, covering both the 'T' and 'L' configurations for 100, 125, 150, and 200 meters. The 'L' type for 200 meters, for example, shows a horizontal 40ft section, a 60ft vertical section, and a counterpoise of four 100ft wires, spaced on 9ft spreaders and suspended at a height of 10ft. The vertical and horizontal sections exhibit flat-top construction. The total wire length of the system is approximately 62% of the length required for a half-wave antenna at 200 meters. In practice, the antenna was tuned to resonance by adjusting the antenna lead and counterpoise lead taps at appropriate points on the transmitter output inductance. From a modern perspective, Kruse's antenna represents a center-loaded shortened dipole 0.31 wavelength long, with one side of the dipole at a height of 10ft! Somehow these antennas managed to conquer transpacific and transatlantic paths despite their probable low radiation efficiency.

The understanding of antenna theory evolved bit by bit in *QST*, with amateur experimentation providing the data. A typical report of such experimentation appeared in the IARU section for November, 1923, where R. J. Orbell (*z3AA*) summarized tests with colleague F. D. Bell (*z2AA*) which were intended to determine the optimum transmission frequency for Bell's 135 meter, half-wave antenna. Conducted over a 150-mile path, the tests involved taking measurements of received signal strength as the transmitter frequency moved downward from 265 to 130 meters in eight steps. Orbell reported: "*To our surprise (not to mention relief) it was found that the signal strength and modulation actually increased greatly as the wave became shorter ... the strength on 135 meters was quite three times that on 265 meters.*" Careful measurements of input power and antenna current at each frequency resulted in data which contradicted the accepted view regarding antenna current: "*The interesting part, however, is the fact that Mr. Bell's antenna current fell from 1.3 amperes on the longer wave (265 meters) to only 0.5 ampere on 130 meters and yet the strength of the signals increased. These results show that the antenna current is not a reliable indication of the power when wavelength changes are made.*" However, Orbell was unable to offer an explanation as to why this was true.

Kruse picked up Orbell's lead and conducted his own tests at *1XAQ*, publishing the results in the February issue under the somewhat misleading title "What the Work With *F8AB* Teaches the ARRL" since the piece barely mentions the *1XAM-f8AB* transatlantic triumph. Never guilty of understatement, Kruse spelled out the lesson: "*We are for the first time doing consistent 3500-mile work because we are (for the first time) using antennas that are large -- very large, for the waves (frequencies) at which they are working. Working an antenna that way gives high radiation efficiency.*" His term "very large" stresses the break with previous practice involving antennas which were very short for the frequency of operation, as we've noted above. Since considerably lower currents were to be expected with the large antenna, Kruse anticipated that *'the tribe of ampere-hounds'* and *'ampere- chasers'* would object that "the series condenser causes a big loss -- we only get half as much current with a big antenna and a series condenser" [*the "series" capacitor was inserted in the antenna lead as a matching device*]. Against that objection, Kruse thundered: "*Buncombe, Brother -- absolute and complete Buncombe!!! How on earth can the series condenser be using up power when it does not get hot?*" The explanation for the decrease in current is simple: "*We have increased the radiation resistance!*" The tests reviewed in the article showed that "*we are now putting more power into the ether than before, even tho the antenna current does drop.*" Determined once again to awaken amateurs to technical truths, Kruse underscored the implications of his findings: "*Now we have practical proof ... that we did not know as much as we thot...and that our antennas are all wrong!*" His account of the tests provides a revealing description of the state of shortwave activity at the end of 1923:

> *Naturally one would not expect that an ordinary amateur antenna would work best on wavelengths that are still lower. This has been tried out roughly at 1XAQ. The antenna is the sort of 'compromise vertical' shown in FIGURE 1, rather under-sized, and can be worked down to 160 meters without any series condenser at all. The location is a good one and transmission is very fair at even 200 meters. It has been very hard to test further down because so few stations have tuners that will receive even as far down as 180 meters -- a disgraceful state of affairs. Our antenna seems to be far too small for the standard amateur band (to 300 meters or so) -- it ought to be much longer, somewhat like FIGURE 2. This was test work but now the idea has been put thru some weeks of steady work with European amateurs and in every case the successful American stations have been using big antennas with series condensers."*

The 'compromise vertical' consisted of a 40ft vertical cage topped by a 50ft semi-vertical wire rising to 70ft, over a 40ft x 30ft counterpoise at 10ft. The suggested antenna of FIGURE 2 used a 100ft semi-vertical wire atop the 40ft cage, and a 100ft x 30ft counterpoise.

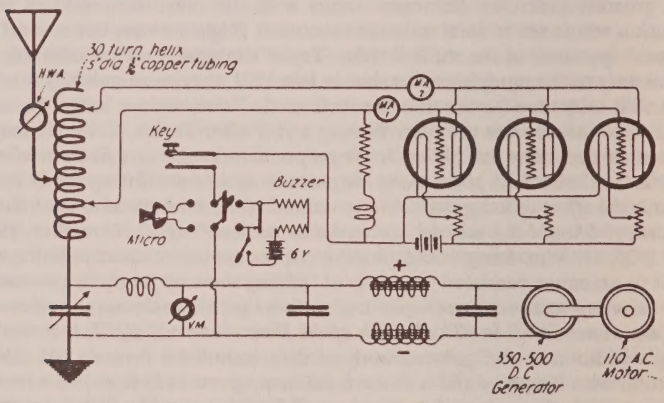
The results of the tests, conducted over a 1000-mile night path are convincing. At 200 meters, with an input of 600 watts and an antenna current of 6.4 amperes, the signal strength was 'good' with fading; but at 90 meters, with an input of 350 watts and an antenna current of 0.6 ampere, the signal strength was 'very strong'. While Kruse and other experimenters were unaware of the possible effects of propagation vs frequency upon the difference in signal strengths, their rejection of antenna current as an indicator of radiated power was sound. The antenna tested by Kruse included a total wire length roughly equivalent to a half-wave at 75 meters; his suggestion of the larger antenna for 150-200 meter operation would result in a wire-length nearly equivalent to a half-wave at 150 meters.

Ultimately, Kruse was right in his explanation for the decreased antenna current in the context of higher radiated power, but his presentation included no actual theory. A. Hoyt Taylor followed with a detailed theoretical explanation in "Antenna Resistances" in the October, 1924, issue, and even though he was correct in some respects, he stressed the speculative nature of his explanation. The mystery of lower currents with larger antennas however, was solved. After explaining the current distribution on radiators up to a half-wavelength, Taylor pointed out that "*everything depends upon where the antenna current is measured.*" If the ammeter is inserted at a current node, "*the actual watts radiated by the antenna may be very high with only a small reading in the meter thus placed, and a situation can even arise when this meter will show almost zero reading and yet the antenna will be radiating very efficiently indeed.*" Lab tests performed by Taylor at the U.S. Naval Lab were cited in which the ammeter was inserted at various points along a halfwave radiator, producing readings from "a few hundredths" of an ampere to "1 to 2 amperes." Further, he drew the novel distinction between "*effective radiation resistance*" and total antenna input resistance, pointing out that greatest radiation efficiency occurs with the maximum ratio of effective radiation resistance to total antenna resistance. Right he was, but several 'wrong guesses' appeared in the same article. Taylor's insights undoubtedly will appear elementary to the modern reader, but in late 1924, they were radically new!

And it took time for the true to sort from the false, and yet longer for amateur practice to incorporate the true. Writing a year after Taylor, Keith Henney could raise such questions as: "*What is the proper wavelength, one half wavelength, or more or less? At which point along the antenna should the driver wire be attached? What is the effect of using two or more vertical wires, each tuned to the transmitting frequency? Should the wire be horizontal or vertical?*" (*RB,* November, 1925). In late 1926, G. Wm. Lang could observe that common amateur practice with respect to antennas consisted primarily of "*putting them up purely by guesswork and then resorting to series condensers and coils to get the antenna(s) into resonance with the transmitter.*" *In "The Length of the Hertz Antenna" (QST,* October, 1926), Lang's addition to the growing body of data included a formula for calculating the total wire length of the half-wave antenna, given as *Feet = 1.46 x Wavelength (meters).* With this constant, a 40 meter (7.5 MHz) antenna calculates to 58.5ft, slightly shorter than the modern dipole because the distributed capacitance of the counterpoise naturally lowered the resonant frequency. A few months earlier, Benjamin S. Melton of General Electric Co. provided the first comprehensive modern explanation of antenna theory and application, bringing together theory and data and applying it to practice in his paper "Straightening Out the Antenna" (*QST,* August, 1926). He explained fundamental concepts such as the use of the quarterwave radiator as the basic unit of antenna measurement, the current

and voltage distribution on the linear antenna for even and odd multiples of the quarterwave radiator, the feedline problems encountered with each type, and the resistances to be expected. He provided a practical explanation of feed systems, including the first appearance of the use of 600-Ohm open-line inserted at the midpoint of the halfwave dipole, and matched at the transmitter end of the line by means of a 'transmatch'. Whitman's "Adjusting the Current Feed Hertz Antenna" appeared in December, 1927, followed by articles on "Matching the Transmission Line to the Antenna" (Roberts, January, 1928), "Directional Characteristics of Transmitting and Receiving Antennas" (Clapp & Chinn, February, 1928), "Tests of a Method of Voltage Feeding the Antenna" (Fuchs, July, 1928), and "The Zepp" (Lamb, September, 1928). By this time, modern antenna theory had pretty well emerged as far as the fundamentals are concerned. But five years earlier when the amateurs began their exploration of the shortwaves, the antenna was a mystery. That our QRP predecessors succeeded so phenomenally is astonishing in view of the extremely limited understanding they possessed in regard to antennas which, ultimately, are the key to QRP success! We can now turn to the story of those early QRP pioneers, possessed with an understanding of the obstacles which confronted them in their efforts to span great distances with very low power, and we can appreciate their achievements for what they were!

1921 Transmitter Circuit Shown by J.O. Smith (*see page 23*). *The d.c. power source consists of a generator driven by an a.c. motor. A key, microphone or buzzer across the grid circuit determined the mode of modulation. The self-excited oscillator circuit used a series LC tank tapped at three points for antenna, plate and grid connections. Taps were determined experimentally. Any change in antenna impedance caused a change in frequency. The grid-leak resistor is to the left of the center tube.*



Chapter 3
QRP Pioneers On The Frontier

1923-24 Zurich R12 Sunspot Numbers: 6:8:24

"...this type of amateur sends out a little message baited with 10 watts, say, and then listens with beating heart for a response from the void... "

Dr. W.H. Eccles, F.R.S.
President, R.S.G.B.

The QRP spirit was abroad in amateur radio from the very beginning of the vacuum tube era. In many countries, amateur radio was synonymous with QRP. But in America, at least for a while, it was simply incorporated as the beginning stage of the vast majority of newcomers' entry into the hobby. Of course, many remained low power operators simply because they saw no need for higher power. The common assumption then, however, was that the beginner would 'upgrade' as soon as he could, meaning, of course, that he would move into a higher power bracket when he felt ready or when his financial situation permitted. Then he would be able to experience the rewards of amateur radio to their fullest extent. Entries in division reports in the 'Traffic Dept.' of *QST* during the early 1920's reflect this attitude in remarks such as "*6OXC* soon to improve with a 50-watter ... *6CRS* advanced to 100w ... " Operating low power, in that view, was merely an initial step, and the sooner ended, the better. Then, as now, power set the boys apart from the men, at least in the opinion of those who need a great amount of power.

It took reports of phenomenal QRP accomplishments by foreign amateurs, and devastating broadsides against the 'ether-busters' by *QST*'s Technical Editor Robert S. Kruse (*1XAM*), to thrust QRP into the limelight as an important facet of amateur radio. In Kruse's perspective, low power operation embodied the ideals and attitudes essential to excellence in the radio amateur. And for several years after Kruse modeled his *New American Amateur* upon the QRP operator, *QST* continued to praise those ideals: knowledge in technical matters, efficiency in practice, and skill in operation. Conversely, *QST* continually derided the abuse of power among American amateurs by coining a long list of derogatory epithets for the high power type. Such names as *'watt- hog', 'ether-buster', 'tribe of ampere hounds', 'ampere-chaser', 'thunder factory', 'watt burner',* and *'most miles per gallon'* flowed across the pages of *QST,* leaving little doubt as to the attitude of the *QST* staff, and presumably the ARRL, to combat the developing dependence upon 'brute power' by American amateurs in place of the ideals embodied in the QRP operator and the *New American Amateur.* Indeed, the reputation of the American amateur was at stake, and *QST* fought to bring him up to par with amateurs in the rest of the world. QRP was publicized in the pages of *QST* during the movement down into the shortwaves not merely as an interesting sidelight of the *real* amateur radio hobby -- it was publicized as a vital and necessary lesson!

Judging from descriptions by Kruse and others, American amateurs appear to have been divided into two groups. By far, the largest consisted of those who operated at moderate and low power levels using UV201's, UV202's, and UX210's at up to 60 watts input. However, the 'wealthy station owner' group, as Kruse had delineated it, had become a prominent development on the scene, and the attitude underlying the group's approach was disturbing to the ARRL and the *QST* staff. It is little wonder that he and other staff writers attacked that attitude, for they saw two negative effects arising from it: the U.S. amateur band

was blanketed with incredibly powerful signals that were heard all over the world, but their very strength precluded Americans from hearing weak DX signals and establishing two-way contact, and furthermore, the resultant QRM level made life difficult for the grassroots operator. Whether his assessment was accurate or not, Kruse clearly identified the high power group with a lack of technical know-how and operating skill. None of the high power operators had contributed anything to the great achievements of the day which were accomplished by operators like Reinartz, who at most used a pair of 50-watt tubes at 150 watts input or so. Kruse himself possessed a 600-watt capability. Presumably he was not simply against high power, but against its abuse and the attitude which usually accompanied its abuse. A combination of reports, editorials, and articles published between December, 1923, and August, 1924, provide valuable insights into the situation to which Kruse reacted in proposing the *New American Amateur.* This series included Kruse's "What Power Have You?", "Miles Per Watt ... A New Efficiency Contest", and F. D. Bell's (*z3AA*) "World Record Broken", all of which appeared together in the December, 1923, issue, an unmistakable indication that the *QST* staff was on the warpath; F. B. Cooke's "An Amazing World Record", in the February, 1924, issue; Warner's 'Editorial' in the March, 1924, issue; and finally, C.D. Maclurcan's (*a2CM*) report on his visit to America, in the August, 1924, issue. From these items, we can piece together the situation which gave rise to the QRP movement in the U.S.

I. The New American Amateur and QRP

"...his plate voltage was 6,000 and current 900 milliamps. 5.4 kilowatts plate input power!..."

When Kruse penned his *New American Amateur* article in early March, 1924 (probably), he was clearly alarmed by the great contrast between the slipshod high power attitude of many American amateurs and the remarkable achievements of foreign operators using QRP and basing their approach on the QRP ideals of efficiency, knowledge, and skill. He had already attacked that American attitude in the December issue when he instituted the station efficiency contest in an effort to turn American amateurs into the proper path. But the foreign operators continued to achieve astounding successes, and Kruse apparently was at the limits of his patience. When that article, "That 'Station Efficiency Contest' and the *New American Amateur*", appeared in the May, 1924, issue, the above concerns were very obvious in Kruse's opening:

> *American amateur radio, about six months ago, had settled down to thinking that we knew it all now. A hard jolt was needed to cure us of this crazy idea. Australia[n] a2CM administered the required jolt -- nothing that ever happened to American Amateur radio has so roused it as those remarkable distance records that Maclurcan hung up. We had never done anything to compare with that -- we very evidently did not know all about it.*

He referred specifically to the QRP accomplishments of C.D. Maclurcan, which had been featured in an article in the February, 1924, issue, which we will review in detail below. For now, what is important is the assessment Kruse made of the previous years of American amateur radio with respect to the harmful attitude noted above. After posing the question: "if we had been beaten so badly there must be a reason. What was the reason?", he goes on to answer:

> *The answer is easy -- we had wasted years in trying to see how powerful we could make our stations, and hadn't learned much of anything about radio transmitters while doing it. Most of us had not given a thought to efficiency -- what did that matter as long as the meter went clear over to 6 amperes? Practically none of us paid the slightest attention to making the signals readable or steady; no, the main idea was to make a noise.*

Ironically, we are indebted to C.D. Maclurcan himself for the most detailed picture of the U.S. amateur practice that Kruse attacked. During the winter of 1923-24, Maclurcan had sailed across the Pacific to the U.S. with one specific purpose in mind: to discover why the signals of Australian and New Zealand amateurs could not make the same trip via the ionosphere. The 'down under' operators had been copying hundreds of American signals during the fall months, and were perplexed at their inability to establish two- way contact. The American signals were a source of amazement to them, and in his note in the December, 1923, issue, F.D. Bell (z3AA) expressed his admiration thus: "*Our hats are off to you fellows, and it is our ambition to push our signals over to you some day, although it will be a much harder job for us than you, owing to inferior reception conditions in the U.S.*" As yet, Maclurcan had not discovered the truth behind those signals from the U.S. The May, 1924, issue of the Australian magazine *Radio* carried his report, which was reprinted by *QST* in August, 1924. The *QST* writer introduced Maclurcan's report in unmistakable terms:

> *Well, fellows, the Australians have us sized up as a bunch of 'duds' when it comes to short-wave reception, despite the late racket about low-loss tuners. Three years ago we bragged about how Paul Godley went to England and showed the British how to receive short-wave signals. Now we can grin on the other side of our face, for Messrs. Maclurcan and Davis, on their recent trip to San Francisco aboard the R.M.S. Tahiti, have shown us up badly by copying, while the ship lay at anchor in San Francisco Bay, the signals of both Mr. Maclurcan's 8-watt and his 100-watt transmitter at Sydney, Australia.*

Maclurcan's report expressed his amazement at the practices of American amateurs in several respects, but the greatest surprise was directed at their power attitude:

> *We were astonished to learn of the amount of power they (Americans) put into their tubes. They do not rate their power as we do, by the actual plate input, but according to what power the manufacturer of the tube rates it. For instance, we visited the station of 6AWT in San Francisco. He employs a single 250-watt valve [tube]. His power is therefore described at 250 watts. But his plate voltage was 6,000 and current 900 milliamps. 5.4 kilowatts plate input power! We were told that 6KA's power was ten kilowatts. If so, no wonder we hear him in Australia!*

At long last, the perplexing puzzle was solved, much to the embarassment of American amateur radio. But for Maclurcan and his colleagues, the solution resulted only in greater frustration than that which had sent him across the Pacific, armed with receiving gear and schedules to determine if the Aussie stations, which "were known to be very efficient" and presumed to be putting "power in the aerial" equivalent to the Yanks, were actually producing readable signals in the U.S. Maclurcan and Davis not only copied the Aussie stations, most of which were low power, all the way across the Pacific, but actually copied the 8-watt signal from a2CM. Although U.S. amateurs had been alerted to the test schedule, none succeeded in hearing the same signals that the Aussie visitors did! Maclurcan's description of band conditions and operating skills is revealing: "*Now, the amateur over there (U.S.) has a great deal with which to put up. The QRM at amateur wavelengths is, at all times, indescribable. At the same time, they are not as used to receiving weak signals as we are ... They have all the power they need to cover America ...* " It is not surprising that QRM resulted when such powers as Maclurcan discovered were being used. No doubt Kruse attacked the same problem. But the real disappointment to Maclurcan was the primitive receiving abilities of American amateurs in contrast to the Aussies. Having only recently received the right to transmit, the Aussies had concentrated upon receiving equipment and skills before permission was granted. "Hence we are able to

successfully handle tuned radio frequency amplification which the Yanks consider of very little more use than the ordinary regenerative detector." Maclurcan's prognostication for successful two-way communication with the U.S. was especially grim: *"I am quite convinced that there is little hope of working with the U.S.A. as things are at present."* He had despaired of success, in short. Since the Aussies were limited to only moderate power levels of 100 watts in a few special cases, and 10 watts for the most part, Maclurcan concluded "we must depend upon increased efficiency for the louder signals" as well as increased flexibility in transmitter circuits. And indeed, Maclurcan's despair was reflected in the fact that Aussies turned their ears elsewhere, establishing two-way communications at moderate and low power levels with England as well as South American stations before the U.S. amateurs were up to the challenge of receiving weak signals.

Small wonder, then, that Kruse and his colleagues were up in arms! One wonders whether Kruse had heard of Maclurcan's viewpoint at the time he announced the *New American Amateur*; regardless of whether or not he did, he was unequivocal about the changes that had to be executed in the U.S. in that announcement:

> *We said at the head of this article that a lot of foolish things had passed out of amateur radio (in the U.S.). Now, it is the turn of the 'ether buster', the 'watt burner', and the lad whose ideal in life is to wreck the antenna ammeter! In place of this pest, we will have the New American Amateur, whose ideal is not a big station, but a good station, who does not care how far his station reaches but who will try to make it perform as perfectly as possible ... in the future, the question will be -- as the ad men say -- 'Not how much, but how good.'*

Admittedly, this is strong stuff for the Technical Editor of *QST* to be voicing, but in those early days, the ARRL fought not only *for* increased allocations, but *against* ignorance and abuses of power even if it meant abusively calling the "big guns" derogatory names and hurting their feelings! High power caused a problem and it had to be eradicated! Editorials and editorial comments constantly appeared throughout the 1920's denouncing discreditable amateur practices, encouraging common sense, and inspiring amateurs to aspire to excellence. In the early days we are describing, for example, K.B. Warner, Editor of *QST*, noted in the March, 1924, 'Editorial' that with the passing of spark days, when range was directly proportional to power, the old 'traffic network' was perhaps no longer needed, for: *"today, with C.W., all that is changed, and the '5-watter' gets as many cards (QSL's) from the opposite coast as the big fellow with the two 250's (250-watters). Power doesn't cut much ice any more. The 5-watter gets in all the tests and often as not grabs the bacon from his big brothers and goes home with it."* Warner's implication was clear: high power is unnecessary when a competent operator with low power can "steal the bacon!" And to be sure, staff writers continually emphasized the participation of moderate and low power operators in the great DX achievements chronicled in *QST* during this period. The 5-watter could be run up to 40 watts input, but it still meant a QRP rig in the company of the 50- and 250-watters!

II. Kruse Launches the QRP Movement

"...doesn't more credit belong to the man who hauls a signal fifty miles per watt than to the one who has to use greater power to haul them only 25 miles per watt?"

Did Kruse intend the *New American Amateur* to be specifically seen as a QRP operator? This is a fascinating possibility. Beyond a shadow of a doubt, the *New American Amateur* embodied the spirit of the QRP operator and the ideals of QRP operation. Then, too, the context of his appearance seems deliberately calculated to make him seem a QRP type. The initial groundwork for his appearance was established in Kruse's announcement of the station efficiency con-

test in "Miles Per Watt" in the December, 1923, issue, and the actual announcement of the *New American Amateur* came in combination with the first published results of that contest in the May, 1924 article. As we'll see below, those results inexplicably included two contacts by a 510-watt station resulting in 'miles per watt' ratios of 4.5 and 6.3! Efficiency? Achievement? By any stretch of the imagination? Hardly! Kruse was up to something. And that something had to be deliberately embarassing the 'watt-burners' by placing their 'achievements' in direct comparison with those of low power operators, with obvious implications. Looking back at the initial announcement of the efficiency contest, Kruse's strategy in listing those two contacts seems quite clear.

The 'Station Efficiency Contest' -- *the first officially sanctioned QRP activity in U.S. amateur history* -- was announced in the December, 1923, issue with a subtitle that reveals the underlying conception: "*Miles Per Watt: An Argument For The Small Set and For Intelligence In Place of Brute Force; Also a New Efficiency Contest*". In other words, the use of low power was inextricably linked with intelligence and diametrically opposite to high power. The article and the contest were occasioned, it appears, by two factors: first, there was Kruse's own revulsion toward the power abuse practices and the meaningless method used by U.S. amateurs in rating their transmitter powers; and second, there was an apparent ground swell of protest from the grassroots American amateur who, as notes in many subsequent articles indicate, operated low power. The importance of the second factor is made clear by the editorial heading preceding the text of Kruse's article, where we learn that "*for the past six months there has been an increasing stream of letters from owners of small stations protesting that it is unfair to compare their work with that of the wealthy station owner who has anything from a quartet of 50-watt tubes to a trio of 250-watt tubes.*" Quite obviously, if we are to judge from the observations by Maclurcan in the previous section, tarnished prestige and injured pride arising from unequal comparisons were not the only factors motivating the 'stream of letters'. It was probably quite difficult for the moderate and low power operator to hold his own on the amateur band, especially in view of the fact that everyone used regenerative detectors which have the annoying operating characteristic of being pulled onto the frequency of an extremely strong station within a certain distance of the operating frequency, or at best, suffering severe cross-modulation instead. With 5- and 10-KW stations running loose on the bands, both problems probably were common.

In his "argument ... for intelligence", Kruse called for 'fair play' in the American tradition, proposing that amateurs adopt as a standard of comparison the ratio of miles covered to watts input, or the 'miles per watt' standard. Future records should be based only upon accurate measurements of actual input power, and not upon the power rating of the tube used. After drawing a rather elaborate analogy between automobiles [*Ford 'flivver' Model-T vs Pierce Arrow*] and radios [*low vs high power*] with respect to fuel efficiency, Kruse argued:

> *It's the same way with the radio set; doesn't more credit belong to the man who hauls signals fifty miles per watt than to the one who has to use greater power to haul them only 25 miles per watt? What if man number two does have a stable full of 'quarter- kilowatt' tubes and a young central station [i.e., like the RCA 100kW 'central station' of world-wide fame], what if his brute power does let him cover 4000 miles, isn't he still inferior to the other man who handled his power correctly and went twice as far per watt?*

Kruse picked his words carefully to make a deliberate point usually; in this instance, note that he did not state the comparison between the two operators in terms such as "isn't the *achievement* of man two inferior to that of man one." He made it a comparison of the worth of each individual personally: "isn't *he* still inferior to the other *man*!" That is what he meant! Today, this would be con-

sidered in poor taste; but bear in mind that the 'muckrakers' wrote during the same period as Kruse, and they didn't mince terms. (Of course, in our modern sophistication, we realize that personal superiority is not implied in comparing a QRP operator who has QSL'd 301 countries with one watt output to another who has QSL'd 325 with a KW.) All that Kruse asked for was fairness in the comparisons: "*Give the man with the radio flivver [i.e., low power transmitter] a square deal -- let him play the game on even terms -- and your ether buster will have to be improved a great deal to show up as well as the little 'pickle bottle set'.*" [This term refers to homebrew transmitters which used coils wound on a hexagonal pickle bottle form, and then removed for insertion into the transmitter.] The challenge to American amateurs to improve efficiency is advanced in the announcement of the station efficiency contest, the results of which were promised for a future issue.

The 'Station Efficiency Contest' had no specific time period -- supposedly, entries were to be submitted whenever operators established contact at what they considered a noteworthy distance per a given power. However, Kruse probably had a strategic reason for the open-ended time period. He had stuck his neck on the line, and could avoid embarassment if the contest did not produce results. But it did! In many essential respects, Kruse's announcement parallels the requests for experimentation published in the early issues of *The Milliwatt* back in 1970. QRP operation is not an end in itself, but a means toward the end of learning more about propagation phenonema, especially in regard to the power vs. distance dimension. Kruse noted: "*The real acid test of a set isn't 'How far have you reached?' but 'How far do you work consistently?' and the best way of determining the consistent range of a set is daylight work. The Technical Editor would like to publish some records along this line -- let us know what work you have done in watts per mile. We will prefer daylight work because that's a thing most of us don't know much about, but night records are interesting too.*" As we noted in Chapter 2, the official amateur allocation at this time was 150-200 meters, but apparently quite a bit of activity was occurring below 200 meters. Kruse and others were well aware of the performance of amateur sets during night hours, and daylight propagation was the unknown dimension. The reports were to follow a specific format which included 12 items: station call, address, owner, operator on duty, date(s), station(s) worked, exact time of beginning and ending of contact, traffic texts in detail if passed, watts input to the plate of the tube, instruments used to measure input (including complete name-plate details), wavelength of contact, and tubes used. The detailed list is very similar to that requested in *The Milliwatt* 'Operating Reports,' and it is interesting to note that a half-century after Kruse initiated the QRP movement, *The Milliwatt* resurrected that movement in precisely the same terms as he used! And this occurred without any knowledge of Kruse's efforts! The QRP spirit inspires the radio amateur to search for the same answers to the mystery of radio in any era.

Regardless of time period, an operator who attempts to operate low power will discover, through his own experience, exactly the same factors as being essential to success, and he will be curious about the same essential phenomena. The QRP operator's power disadvantage forces him to isolate those factors in order to achieve success. In any event, Kruse would probably be gratified to learn that the ideals he attempted to ingrain in American amateur radio over a half-century ago have experienced an unprecedented blossoming during the past decade, and that the operators who follow those ideals are growing into a very significant portion of amateur radio as the years move along.

III. QRP Exploits in 1924: U.S. Amateurs Outdone

"...those remarkable distance records that Maclurcan hung up..."

1924 was a year of fabulous achievements by radio amateurs in their quest to bridge oceans and establish two-way communication with their foreign counterparts. Feature articles appeared regularly in *QST* detailing those accomplishments, and low power operators received their share of the publicity. The December, 1923, issue set the groundwork not only in regard to Kruse's "Miles Per Watt" article, but also because of an announcement in the "International Amateur Radio" (later the IARU) section which was headed by the claim "World's Record Broken". In the report, F.D. Bell (*z4AA*) provided a detailed report of the American stations that had been received by Aussie and Zealander operators, and paid American amateurs that mistaken compliment that was quoted earlier (*"Our hats are off to you ..."*). As yet, Maclurcan had not returned from his American visit with the truth. Bell interrupted his summary report to detail the world record, and the account is short enough to quote *in toto*:

World's Record Broken

On their ten watts input some of the Australians come in surprisingly QSA over here (New Zealand), so loudly in fact that it occurred to me that it would be possible to receive them on much lower power. Accordingly, I got into touch with Mr. Jack Davis, a2DS, Sydney, whose ten-watt ether-buster provides us with some of the loudest signals that we receive from Australia. After several nights we have what we claim to be a real world's record for low power valve [i.e., vacuum tube] transmission, namely --

1200 MILES ON LESS THAN ONE WATT C.W.!

A few extracts from the tail end of my log of the night of Aug. 17th (1923), [R12 Smoothed Sunspot Nr: 6!] tell the story. Mr. Davis had just succeeded in getting speech and key over to me with 1.4 watts input to his set, using twenty milliamperes at seventy volts on the plate of his single five-watt (input rating) B.T.H. transmitting valve.

-- 4AA to 2DS: 'QRP to one watt and ask a question.'
-- 2DS to 4AA: 'Wl go as low as I can. QRP nw. Sec.'
-- (Called up again and asked on key) 'What is ur power?'
-- 4AA to 2DS: 'My power forty five watts. Wat's urs?'
-- 2DS to 4AA: 'LESS THAN ONE WATT!'

At this stage Mr. Davis was using only sixty-five volts on the plate. The receiver here employed two stages of tuned high-frequency amplification and a two-step audio. The aerial was a seventy-foot twin cage.

This QRP test took place on 1250 kHz, where the antenna noted was very short for the frequency, as we've discussed in the previous chapter. By today's standards, 1200 miles per watt seems totally un-newsworthy. But even today, 1200 m.p.w. on 160 meters raises eyebrows, especially with less than one watt input to a 70ft antenna! To put the contact in perspective, the *a2DS-z4AA* contact is equivalent to an under-one watt station in Pittsburgh working South Dakota in the middle of the a.m. broadcast band using nothing more than an 80 meter quarterwave vertical with at best three radials! Try it sometime! Further, voice communication was established at the 1.4 watt input level! However, this contact was not the first that had been reported in the IARU section. In the August, 1923, issue, the report from Australia noted that Maclurcan, *a2CM*, had frequently bridged the 1400-mile distance using 16 watts input. The 'down-under' operators were limited to low power levels, and their work consequently led them to an emphasis on QRP techniques and principles.

That was revealed clearly in the article about *a2CM*'s phenomenal records published in the February, 1924, issue, in "An Amazing World's Record: Australian Station Sets New Standards for Amateurs," by F. Basile Cooke, F.R.A.S., Vice-President of the Australian Radio Relay League. This was the

QRP bomb that provided the "jolt" mentioned by Kruse that was necessary to shock American amateurs from their lethargic reliance upon high power. The power restriction was cited as a major factor in the work by a2CM and other Aussies: "*The experimenters in Australia, especially in the cities, are only allowed 10 watts of power, consequently great attention has been given to reaching long distances with a minimum of power. Mr. C.D. Maclurcan (a2CM), of Sydney, is so far the leader in this work.*" The "new standards" cited in the editorial heading refer not merely to a2CM's distance records, but to the ideals which Kruse had been promoting. We learn of Maclurcan's explanation for his work: "Mr. Maclurcan stated that he considered his success entirely due to an absolute regard for detail. He has an ideal site for his station and has very carefully designed his aerial and all component parts, there are no loose wires or poor contacts, and every part of his gear has been thoroughly measured and tested." His regard for detail is evidenced in the fact that, following the record-breaking tests, Maclurcan enlisted the services of an expert (presumably a lab technician) to verify the accuracy of the instruments used to monitor power during the tests to within 1%. Maclurcan wished to leave no doubt as to the veracity of his claims, and his approach exhibits the care of the scientific investigator.

Maclurcan engaged in several tests prior to establishing the ultimate record. At first, he worked the 500 mile path between Sydney and Melbourne, following procedures that will be familiar to modern QRP operators:

> *Mr. Maclurcan started up on Monday, September 24th [1923], at 5 P.M., while there was still an hour of daylight, and called a3JU (Mr. Hull of Melbourne at 500 miles). Arrangements had previously been made for conducting low power tests, a code letter to be used for each reduction in power. The code letters were known only to Mr. Maclurcan and it might be mentioned that Mr. Hull was not aware of the power being used. After establishing connection Mr. Maclurcan commenced reducing power and sent the following test on 240 meters.*

The test included the following code-letter vs. power input levels: 7.8w: 'F', 4.32w: 'K', 2.2w: 'R' (not copied by 3JU), 0.48w: 'V', 0.24w: 'L', and 0.078w: 'X'. At the lowest power level, a miles per watt record of 6410 had been accomplished. Maclurcan had no witnesses to this first test, so he arranged for another test the following day, at which Mr. J.S. Barling was present to verify all measurements and a3JU's reception of the code letter for each power level. During this test, reception was accomplished down to 0.12 watt input, but a 2 kW spark station two miles from a3JU QRM'd the final attempt at 0.044 watts. But the real world record test occurred without pre-arrangement, as Cooke related:

1500 Mile Tests

> *On the following Wednesday Mr. Maclurcan called Mr. Frank Bell (z4AA) of Waihemo, Shag Valley, New Zealand (1500 miles over land and water), who replied and asked 2CM to conduct a low power test with him then and there. After chatting for half an hour (with an input of about 8 watts!!–Ed.) the test commenced at 9:30 P.M. Conditions for receiving in New Zealand were good. (By American standards they were more nearly miraculous!!-- Ed.)*

The editorial comments were probably by Kruse. The drama unfolds as a2CM lowered power through several levels:

> *The first test went out at 175 volts with a plate current of 4 milamps., making a power input of 0.7 watts. a4AA replied "QSA [i.e., 'I read you'] QRP give plate current and voltage." The power was then reduced to 0.04 watts input to the plate. (40 volts and 1 mil-amp.) Again a4AA thot unnecessarily great power was being used. The next test was at 20 volts, absorbing 0.5 milamp. This also did not seem to satisfy a4AA who not only received the code letter but received and repeated whole sentences.*

As it was past midnight in New Zealand and nearly that in Sydney, only one further test was agreed to. Mr. Maclurcan this time determined to satisfy even Mr. Bell, so he reduced his plate voltage to 15, thereby securing a plate current of .25 milamp. The input was only 0.004 watts.

This we can understand in our solid-state age -- 15 volts at 0.25 milliampere sounds like a weak transistor! Even this level did not establish the lower limits of Bell's receiving capabilities, for he repeated *a2CM*'s message back to him, and then sent: "*OK QSA sigs strong and steady throughout. Another world's record gone west. Congratulations OM GM. Bell.*" Presumably Bell and Maclurcan were a bit excited, but the typical British Empire reserve shows through even in Cooke's account. The next morning, Maclurcan had one 'Mr. Joseph' verify the accuracy of the meters used to measure the input power. The Editor of *QST* accepted the verification: "*There is no doubt about this--it absolutely happened.*" The *phenomenal record of 375,000 miles per watt* would be remarkable even today if accomplished on present-day bands such as 10 meters using a good beam! But it took place not on 10 meters, but on 240 meters -- 1,250 kHz!

The QRP test, unbeknownst to Maclurcan, however, was not quite over. The next day a telegram arrived from one 'Mr. Odjers' tersely notifying Maclurcan: "*Heard your lowest power last night, writing. Odjers. Charters Towers, Queensland.*" Charters Towers was located 1400 miles north of Sydney! Odjers' follow-up letter repeated the complete log of transmissions and messages from *a2CM* to *z4AA*! The reception record via Odjers represents a mere 350,000 miles per watt! A double record in one sitting. Understandably, Maclurcan became a QRP hero in the eyes of the world as news spread about the achievement. He remains in that position even now, as readers will undoubtedly agree.

C.D. Maclurcan *(a2CM)* **in his station.** *QST, May, 1934, caption read: "this station did much stunning DX ... a2CM was noted also for extraordinary transmission over distances up to 1500 miles with a power of a few hundreths of a watt." The 'Twenty Years of Amateur Radio' text included it as one of only three 'on the air' triumphs: "In Australia, 2CM worked 1500 miles to New Zealand with 0.004 watt."*

Maclurcan's antenna system provided the critical factor in his success. It was relatively large according to American standards, consisting of the 'T' type with a horizontal section of 100ft, of 4ft diameter cage construction, with an 80ft vertical cage tapering from 12 inches to 4 inches. The counterpoise was 7ft above the ground, of an unspecified number of wires, positioned as our present day radials are and occupying a diameter of 100ft. The antenna resistance was 8.7 Ohms, a fair indication that the radial system was probably functioning as a true groundplane. Inspired by Maclurcan's successes, the local radio club conducted some experiments to determine the lowest power at which the QRP transmitter could be made to oscillate, arriving at a final figure of *320 microwatts.* Further QRP tests were planned in view of the fact that several locals at distances of up to 12 miles copied the oscillator at the 320 microwatt input level. No report ap-

pears of any further tests in *QST*. Perhaps they are chronicled in publications of the Australian Radio Relay League of the time. Further research is needed in that area.

IV. American QRP'rs Enter the Battle

"...there is no end of interest in the business of working better distances with low power..."

But to return to our subject, it is not difficult to understand why Kruse could term Maclurcan's accomplishments a "jolt" to American amateur radio. At that time, patriotism was high -- the U.S. entry into WWI had 'saved the world for democracy' and the U.S. had an arrogant attitude about its position as 'No.1' in everything. Clearly, it was 'No.1' in everything except the technical knowledge and skill required for the accomplishment of such QRP feats as *a2CM* had done. In the eyes of any decent American, that was an intolerable situation, and the ARRL let its members know that to be the case. In effect, QRP not only provided a vehicle for the principles and ideals that contribute to amateur excellence, it provided a competitive focal point through which American talents could be measured against those possessed by amateurs in the rest of the world.

From then on, *QST* reports of great DX achievements gave credit to moderate and low power stations, singling them out among the high power stations for special mention. For example, in the same issue that the *a2CM* achievement appeared (February, 1924), in the lengthy summary "The Progress of Transatlantic Amateur Communication", attention was drawn to the work of American *2AWS*: "*All the low-power records go to Porter of 2AWS, Freeport, NY, who did the job with two '5-watters' with 0.8 amps antenna current: tie that!*" *2AWS* is one of nine Americans credited with the transatlantic feat. Another individual was singled out for special mention: "*2AGB has the record at this writing for the greatest number of EU worked, having communicated with f8AB, f8BF, g2SH, g2OD, and nPC11 (Netherlands). All of this was done with one 50-watter with a hole in the plate, putting 1 lonely ampere in the antenna at 118 meters.*" While both *2AWS* and *2AGB* could have been running up to about 100 watts input, the point is that the staff writer treated them as low power operators, and the antenna currents mentioned would definitely imply real low power in the eyes of the 'watt burners'. An interesting sidelight is the staff writer's excitement that two-ways had been established across the Atlantic by nine Americans, and he apostrophized: "Oh! For the pen of a Wells, to picture the possibilities opened to amateur radio on both sides of the Atlantic, now that we are QSO!" In any event, two of the nine operators were presented as low power types.

In the IARU report, we find the typical emphasis upon QRP in DX quarters when it is noted that Sweden had five licensed amateurs in operation "and at least two of these are in touch with Britain on very low powers. *SMZP* has worked *g2KF* and *SMZZ* has changed signals with *g2XG*, the former using 10w, the latter 20w." For the remainder of the decade, the IARU report would continue to present a picture of foreign amateur activity exhibiting a fairly even balance between real low power operators and higher power types. We will turn later to those reports because the information included in them was of high interest to the American DX'er, and what he met in those reports included many QRP achievements and, overall, fabulous DX work at low and moderate power levels. It was a picture that backed up Kruse's criticism of the abuse of high power in America.

With respect to the accomplishments of American QRP operators, the first publication of results from the station efficiency contest appeared in the May, 1924, issue, along with the introduction of the *New American Amateur*. The list of 22 contacts by 17 stations placed the American operator in a rather inferior stance following the exploits of Maclurcan, and Kruse reminded his readers of those exploits. The list is a curious conglomeration. To add insult to the injury

inflicted by *a2CM* to American pride, the highest miles per watt record on the list was attained not by an American, but by Canadian *c3NI*, of Ft. William, ONT, who worked *u4XC* of Atlanta, GA, with an input of 0.36 watt over a distance of 750 miles, for a record of 2080 miles per watt.

Station Efficiency Contest Results. *(QST, May, 1924)*

Call	QTH	QSO'd	QTH	Date	Miles	Watts	M.P.W.
9CNY	Kan.	*9EL*	Kan.	1/12	20	.062	**319**
9BOP	Ind.	*4EB*	Ga.	1/3	500	28	**17.8**
9BOP	Ind.	*9CLW*	Kan.	2/29	500	28	**17.8**
8CF	Mich.	*3JJ*	D.C.	12/3	400	34.5	**11.6**
4OY	P.R.	*3BDO*	N.J.	12/9	1500	?	?
3NI	Ont.	*4XC*	Ga.	?	750	0.36	**2080**
c1BQ	N.S.	*g2OD*	Englnd	?	3000	20	**150**
c1BQ	N.S.	*c3BQ*	Ont.	?	1000	0.8	**1250**
c3BQ	Ont.	*c1BQ*	N.S.	?	1000	1.4	**711**
c9BL	N.S.	*c2BN*	Que.	29	700	1.25	**560**
9AHH	Ia.	*9DES*	Kan.	127	80	0.6	**133**
5ZK	La.	*8DWK*	Mo.	12/30	400	67.5	**5.9**
5AHD	Okla.	?	?	?	400	50	**8**
8HJ	N.Y.	*1BVB*	R.I.	11/9	450	0.6	**750**
9AHH	Minn.	*9DQU*	Ill.	7/8	400	0.51	**782**
6AWS	Cal.	*7MN*	Alaska	?	1000	16	**62.5**
6AWS	Cal.	*6CEU*	Hawaii	?	2200	16	**130**
6AWS	Cal.	*8BDZ*	W.Va.	?	1300	16	**81.2**
7AIB	Wash.	*WNP**	?	?	?	35	**74**
3SM	Pa.	#	?	?	6500	165	**39.4**
5HT	Tex.	*7MN*	Alaska	12/28	2270	510	**4.5**
5HT	Tex.	*6CEU*	Hawaii	12/26	3200	510	**6.3**

**Greenland; # Pacific Ocean*

Kruse's publication of this collection of contacts is puzzling when one considers that the point of the efficiency contest is a 'good station' rather than a 'big one'. From an editorial viewpoint, the list is seriously flawed if it is supposed to actually make that point. For example, of the 12 American stations listed, two operated in excess of 100 watts, and one of those is shown with an input of a half-kilowatt! *5HT's records at 510 watts input represent 4.5 and 6.3 miles per watt*, hardly a model of efficiency! Of the remaining Americans, four operated between 28-68 watts (*9BOP, 8CF, 5ZK,* and *7AIB*), while *6AWS* showed 16 watts, leaving three operating at the below-one watt level: *9CMY, 9AHH,* and *8HJ.* The three had records showing a spread from 133-782 miles per watt. The moderate power group showed records considerably under 100 m.p.w. while the 510 watt station, as noted, recorded 4.5 and 6.3 m.p.w. One is tempted to speculate that Kruse deliberately included the moderate and high power contacts to drive home the point he made in the December, 1923, announcement of the contest: "*give the man with the flivver a square deal ... and your ether-buster will have to be improved a great deal to show up as well!*" Indeed, the list is as subtle as a sledgehammer blow! Interestingly, Kruse made absolutely no comment on the results shown in the list, other than to point out that 13 other entries were omitted because of lack of data or use of an illegal wavelength! It seems unlikely that Kruse would pass up the opportunity to comment -- unless the point was absolutely clear from the list itself!

Another intersting aspect of the list is the Canadian listing, showing four genuine under-two watt contacts with a m.p.w. spread of 560-2080. Kruse made no comment upon the work of these individuals who top the records of all but

two of the Americans. Another point being made subtly? Finally, the inclusion of the *4OY- 4RJ* Puerto Rico to New Jersey contact adds another layer of mystery. No data was included in the entry, the very reason cited by Kruse for excluding 13 other entries. His 'rules' for including contacts obviously were not consistently applied. The contact is tantalising as a QRP achievement, since the plate voltage is shown as 60 volts and the distance as 1500 miles. At this voltage level, the UV201-A could be expected to develop an input of less than one watt; if this were the case, the contact would clearly establish the record for the list. If the list were re-arranged in order from highest to lowest, it would begin with the Puerto Rican station, proceed through the Canadians, and then cover the Americans.

In addition to announcing the *New American Amateur*, the article contained 'operating hints' from the entrants, as summarised by Kruse. He noted: "At least half the men submitting logs say that their success with low power [*510 watts*?] is due mainly to a good tone and a steady wave [*i.e., stable frequency*] secured by running the tubes conservatively." With respect to operating technique, he noted: "Four of the men also point out that in low power work, it is particularly necessary to call in an orderly fashion. No one will listen to a weak signal that makes 164 calls [*i.e., general 'CQ' calls*] before signing." The QRP operator aimed at making contact, unlike the 'plague' of the age, namely the 'CQ hound' whose only objective was to be heard by listeners and who was ridiculed in the 'Calls Heard' and 'Correspondence' sections in *QST*. Kruse invited further participation and closed by noting that "and certainly there is no end of interest in the business of working better distances with low power." Amen, brother! Even though QRP would fade from the public view in 1926 or so, the grassroots operators would continue to follow that approach throughout the years.

V. The Emergence of the QRP Operator

"...the excellent work shown above should be a reproach to those hams that need inputs of a 1000 watts..."

Kruse's efforts at instilling the principles associated with successful low power operation were supplemented by others. Ironically, Kruse was outdone in advancing the QRP operator as a pioneer in the vanguard of amateur exploration and discovery by a Britisher, Dr. W.H. Eccles, F.R.S., a well-known scientist who happened to be the president of a predominantly QRP organization (The Radio Society of Great Britain), for amateurs in England were limited, like their 'down under' counterparts, to powers of 10 watts input and less. Special licenses were required for higher powers, and apparently these were difficult to obtain. English amateurs, as a result, focused upon efficiency. In mid-1924, Dr. Eccles addressed the R.S.G.B. annual convention on the subject of "The Importance of the Radio Amateur", and this speech was published in the U.S. in the November, 1924, issue of *Radio Broadcast*.

Between the May publication of the results of the efficiency contest and the appearance of Dr. Eccles' address, QRP had received no feature space. But through the deft and subtle strokes of Dr. Eccles' pen, the QRP operator, British style, emerged in all his nobility; Eccles, although a scientist by trade, had an overpowering sense of the human dimension of the low power experience. The individual whom he chose to support his argument in favor of the continued existence of amateur radio in England embodied the finest qualities of the human spirit. And the dimension of the radio experience that he chose to emphasize was that human dimension represented by the lone QRP operator challenging the limits of Nature. Would that we could sit attentively and listen as Dr. Eccles spoke his description:

This type of amateur sits in his laboratory and sends out a little message baited with 10 watts, say, and then listens with beating heart for a response from the

void. Usually his cry is in vain. He draws a blank. But sometimes he hears, mixed up with his heart throbs, a reply from another 'brass pounder' calling him by his sign letters. What a thrill! And when the response is faint and seems to come from very far away, with what excitement does he struggle to maintain touch? I can imagine the anxiety and enthusiasm with which he deciphers the Morse, say, of an American amateur, is overpowering; and I can imagine the despair with which he battles against the demons of fading and interference...

It is edifying that, back at the very beginning of the QRP movement, Eccles could so accurately and precisely capture the essence of the QRP experience, describing it almost as Shakespeare would. No one could have done so in such terms -- unless he himself were a QRP operator. Dr. Eccles must have been that type of amateur! Without distinguishing between the low power and high power operators, he went on to clarify the contribution to science and commerce made by amateur DX work:

As another example of the utility of this DX work, consider the recent results achieved by a small band of private workers who, during the last month or so, have been trying to find lanes under the Heaviside layer, across the Atlantic. You all know the success which has been attained with short waves throughout an unexpected number of hours in the twenty-four. I do not doubt that if these amateurs had left the problem alone we should to-day be ignorant of its possibility. It might have been many years before these facts would have been revealed in the ordinary course of things. The feat is not an easy one.

DX work, furthermore, contributes valuable skill and experience to operators who potentially are a resource for military communications operations: "*It teaches a wonderful skill in manipulation, and it screws up the efficiency of the apparatus and the man to the highest pitch. The DX man, striving to get across enormous distances with minute power, becomes far more expert than the professional operator.*" This comment comes in the context of the QRP operator. For Eccles, the human drama of the lone individual challenging Nature's limits, armed only with 'minute power' and infinite patience and skill, is the essence of the amateur experience that has contributed so profoundedly to the advancement of science. And that individual was the QRP operator! Small wonder that, with an individual such as Dr. Eccles at the helm, the RSGB would spawn *The QRP Transmitters Society of Britain* a few short years later.

While Dr. Eccles' address was not published until November, 1924, and in a magazine other than *QST,* it seems probable that his sentiments were fairly well-known among readers of *Radio Broadcast* which catered to the broadcasting industry and the broadcast listening hobby group. It was from this group that many new amateurs emerged, and undoubtedly Dr. Eccles' portrait influenced their concept of the radio amateur. Two months earlier, though, *QST* published a beginner's article in which the construction of "A Five Watt Sending Set for $25" was described. The article is something of a classic in that it not only provides circuitry, but also basic explanations to the beginner of the principles underlying every aspect of getting started in amateur radio. The article conditioned the newcomer to the viability of the QRP approach in the editorial heading: "*Even in these days of 250-watt tubes and big motor generator sets there are a large number of amateurs whose limit financially speaking, is a lone '5-watter'. Here is a set using one 5-watt tube that is not expensive to build, yet it includes the latest kinks in amateur C.W. practice. This set will make a fine companion to your 'low-loss'* tuner." This type of heading would continue to introduce construction articles in *QST* directed at newcomers ever after.

The attitude and approach described by H.F. Mason is representative of then current grassroots practice among U.S. amateurs. The key to this approach is homebrewing to cut expenses. In justifying this approach, Mason alluded to a

very familiar situation in which a son requests financial assistance from a father, who responds: "How much is this thing going to cost?" It provides the youth with options for closing the deal with dad: "Well, that all depends. You can buy all the fixin's and do-gadjits and make a set that costs a couple of hundred dollars and still have only a 5-watt set, or you can buy a few things, make the rest of the parts yourself, hook 'em up in a good circuit, and talk to amateurs several hundred miles away for $25. The latter sounds the best." Mason wasn't joking about homebrewing 'the rest of the parts'. *QST* carried articles about the construction of everything except meters and tubes, and even in regard to tubes, published one lengthy note describing how the separated filament elements of a tube could be re-welded electrically by the patient (and lucky) amateur.

The '5-watt' classification given in Mason's article was modified in accordance with Kruse's earlier comments (noted above): *"But wait a minute; the title to this story is wrong. This set we are going to build will have about 30 or 35 watts in its plate circuit and will put 10 or 20 of them into the radiating system. So even though it does use only a '5-watter' we wouldn't want to come right out in the open like that and call it a 5 watt set..Let's call it a set using one '5-watt' tube, that's better."* The pedagogical approach here is quite effective, alerting the newcomer to the common malpractice, explaining its underlying error, and then suggesting the proper perspective. Later articles follow a similar approach and offer many similar points in a sustained effort to re-educate the old timers as well as put newcomers on the proper path to better practices.

With the December, 1924, issue, low power achievements once again received prominent attention in *QST*. A feature article, "Antipodes Linked by Amateur Radio; New Zealand and British Amateurs Work 12,000 Miles -- All Records Smashed -- New Zealand Stations Showing the World", returned attention once again to the fantastic DX work of the low power Aussies and Zedders. The Editor, K. B. Warner, reiterated the implications of their successes: *"Get ready for a shock, gang. The laurels in this little old game of amateur radio no longer belong to America. We're barely in it. A whole string of new records have been hung up during the months of September and October (1924) [R12 Smoothed Sunspot Nr: 19-21] by the busy amateurs of New Zealand and it will probably be a long time before we can even up the score."* The major achievement was the QSO between Frank D. Bell, *z4AA* and *g2SZ* in London on October 19, 1924, and then on October 25, between Ralph Slade, *z4AG*, and Gerald Marcuse, *g2NM*, establishing a new DX record of 11,900 miles. American amateurs were finally working the Zedders regularly at distances, Warner noted, "that would cause us to swell with pride were they not so greatly exceeded by the New Zealand to England communication." Further, New Zealand signals "are now almost commonplace throughout the U.S. and Canada."

The second half of the report detailed work between New Zealand operators and R.Y. Orbell, *z3AA*, sailing across the Pacific via Cape Horn on the *S.S. Port Curtis* with an amateur station on board running 50 watts input. The *z3AA* work was summarized: *"Latest reports up to this writing show that New Zealand amateurs have kept in touch with him (z3AA) every night since he left home, handling messages and testing."* The contacts selected for special mention were QRP: *"3AA reports z2AC, 4AA, 4AG, and 4AK nice at 5600 miles; he worked Jack Davis (a2DS) of Sydney, whose input is 15 watts at 4750 miles, and z3AL, 12 watts input, at 4600 miles ..."* Warner drew the obvious comparison: *"We don't know anything about such monotonous DX with such powers in this country."* The work occurred between 75-100 meters. Finally, observations by Chas. E. Biele, *u2AOS*, an American who visited prominent New Zealand amateurs were included: *"He says the fellows are the finest amateurs in the world, and they have shown him the time of his life. Their radio conditions are marvelous, unheard of distances being*

achieved in that part of the world with practically no power." Again, low power achievements shared the spotlight with those accomplished with high power.

By the time the second list of results in the on-going efficiency contest were published in December, 1924, amateurs had been granted allocations extending down to 5 meters in four bands, but the contacts on the list represent work done on the old 150-200 meter band. While the list included only eight entries, all are genuine QRP contacts, except one at the 80 watt level. L.W. Hatry (*1OX*) had recently joined the staff and took over Kruse's work with the efficiency contest, and "More Low Power Work" appeared over his initials. He began by noting that "these are all summer incidents [*R12 Smoothed Sunspot Nr: 16-18*] and, for that reason, should be all the more interesting. Practically all the work was done at night," drawing attention to the fact that such accomplishments were possible during the worst season of the year. Noteworthy is the fact that tube types have been included as part of the data.

'More Low Power Work' - Records. *(QST, December, 1924)*

Call	QTH	QSO'd	Date	Miles	Volts	Watts	M.P.W.
9RQ	Ill.	*c3GG*	May ?	700	50	?	?
9BFI	Minn.	*9BNF*	5/8	170	100	0.2	**850**
7AIB	Wash.	*c5BF*	5/14	100	70	?	?
3AIH	N.J.	*1BQE*	June	208	41	0.08	**2600**
g5BV	Engl.	*9CVR*	June	?	?	0.25	**124***
8PG	Mich.	*8BFB*	July	20	5	?	**12731**
9CDV	Minn.	*7GR*	Sept.	1300	200	1.5	**940**
8DOE	Mich.	*6BUR*	July	2000	?	8.0	**250**

**Corrected M.P.W. figure of 16,400.*

As in the previous list in the May, 1924 issue, the DX operators came out on top. The *g5BV-9CVR* contact is truly remarkable -- not merely a transatlantic, but a transatlantic plus half of a transcontinental! And with an input of but 250 milliwatts for a quite respectable record of 12,731 miles per watt on 150 meters. Hatry singled *g5BV* out for special praise: "*The record of g5BV deserves special mention on two counts: he was using a temporary antenna only 18ft high at one end and 35ft at the other, and his antenna current was 0.65 ampere.*" This current level at an input of 250 milliwatts may be puzzling to readers, since we've seen that level of antenna current associated with up to 30 watts input or so. Bear in mind that antenna currents are high when the feedpoint is at a current loop of a short antenna exhibiting a low input resistance, and a seemingly exorbitant antenna current can result. In any event, *g5BV*'s installation was probably of very low efficiency, and his actual radiated power probably considerably under 100 milliwatts, which makes the feat even more remarkable.

Hatry included a comment about the *8DOE* 80 watt contact that places the 'flivver' spark-coil plate supply into clearer perspective: "*he used a spark coil supply and the input to the spark-coil itself was 80 watts. Because of inductive transfer and the heating at the contacts of his vibrator, his actual input to the tube would be, most likely, much lower; however, we don't know that wattage definitely.*" The miles per watt figure given for the *8DOE* contact seems an error, as well as the power shown in the list. Hatry added an interesting note regarding 'bogus' QRP records: "*The record of 8BPG deserves special mention also. It shows what this low power business can degenerate into. Someone is going to get a 199 oscillating on a one volt B battery and work his friend two blocks away, and then we will have a miles per watt record that would take a certified accountant five minutes to merely think of.*" Hatry apparently had missed the details of *a2CM*'s experiments resulting in reception of a test oscillator at 320 microwatts over a distance of 12 miles (a 37,500 m.p.w. record) and his comment is very appropriate in such a context.

The 'Station Efficiency Contest' and subsequent 'Low Power Reports' were intended to determine power vs distance possibilities for normal operation.

Hatry encouraged readers to continue to submit reports: "*Not enough really low power work is being reported upon, and not enough of that reported follows the form-outline given in QST of last November (actually, it appeared in the December issue). We are still interested in these low-power accomplishments.*" Note that an interesting shift had occurred in the thrust of the original 'efficiency contest' concept. It now became "low power work" as opposed to efficiency at whatever power level. The work of the DX operators probably caused the shift. Also, one wonders whether Kruse's May, 1924, list had an adverse impact, for a comparison of the two lists shows a fundamental difference. Where only three genuine very low power contacts by Americans are included in that list, here seven such contacts comprise the bulk of the list. Did Kruse inadvertently discourage entries from anyone running more than a watt or two, or did the publicity of foreign achievements have the same effect? In any event, the June, 1925, report showed a substantial increase in activity, as we'll see in the next chapter.

Finally, Hatry reiterated Kruse's earlier criticism of American reliance on high power and based his comment directly upon results of the efficiency contest to that date: "*The excellent work shown above should be a reproach to those hams that need inputs of a 1000 watts and all kinds of exciting antenna currents. In most of the cases above, the antenna current could not be measured on the instruments in the possession of the station owners.*" The publicity that QRP achievements had received during 1924 indeed supported the contention that high power was unnecessary for long distance work on the bands above 150 meters. 1924 was a remarkable year in that it thrust the QRP operator into the spotlight as the conquering hero of the shortwaves who showed the radio world the ultimate possiblities of radio communication! QRP publicity in 1925 added to that image.

Chapter 4
1925: QRP Takes the Spotlight

Zurich R12 Sunspot Numbers: 25-61

I. Exploring 40 and 20 Meters

"...the Colonel has thoroughly convinced himself that for excellent DX a 201-A furnishes ample power provided it is built into a really low-loss transmitter..."

On July 24, 1924, the government extended the amateur allocations to include 75-80, 37.5-42.2, 18.8-21.4, and 4.69-5.35 meters. While the 80 meter band exhibited some substantial differences with respect to propagation in contrast to the 150-200 meter band, the real differences occurred below 80 meters. The movement to 80 meters appears to have been on the magnitude of a gold-rush. Writing in early October, Kruse noted "every transmitter in America seems to have found the 80 meter band -- altho there may be 5 or 6 exceptions." However, it was a different story on the 40 and 20 meter bands. Some adventurous operators have moved to 40, and Kruse noted that "the pioneers are doing splendid *daylight* work on that band." With regard to 20 and 5 meters: "dead silence!" Each movement downward required refinement of equipment and discovery of the peculiarities of the new band; in a word, to find out what it was 'good for'. Low power became a means of discovering that.

The January, 1925, issue began the year with the announcement of The Cooper Cup and two companion cups offered by the ARRL for the purpose of encouraging development of the new bands at 40, 20, and 5 meters. J.T. Cooper of Atlanta, GA, conceived the contest idea for the 40 meter band, and the ARRL, seeing the possible advantages, offered the cups for the other two bands. The three simultaneous contests ran between February 1 and May 26, 1925; results appear to have never been published in *QST*. In providing background about the contest, Kruse summarized recent 40 meter tests: "by daylight, it [*40 meters*] seems to out-range (many times over) any wavelength in the 75-80 or 150-200 meter band. Between one pair of stations the recent tests have shown that it was possible to work two-way for 220 miles *daylight* at 40 meters with an input of less than 15 watts. The same stations have no daylight communication on any other wave, even with powers as high as 150 watts." Everyone was still in the dark as to what was really happening on the new band. With respect to the other two bands, Kruse noted: "*Practically nothing is known about the 4-5 and 20-22 meter bands.*" Unknown to Kruse, Reinartz was conducting his famous 20 meter explorations at the time Kruse was writing the contest announcement in mid-November, 1924.

One flaw with the Cooper Cup contest is that it was not really clear what a participant was supposed to do to win! The only clear component of the contest concept is the power limitation. The rules specify: "*1 -- the sending tube shall have a manufacturer's rating of 5 watts output or less. Only one tube at a time may be used.*" As has been noted, the UV202 or C302 were typical 5-watters and could be run at up to 40 watts input. The explanation for the power limit is: "*The purpose in offering the cup is to encourage careful, detailed work of an original nature. The idea is not to put a premium on the use of much power.*" Kruse went overboard in regard to the 'detail' required in entries, which had to be notarized as to the tube type and power level used. He exhorted readers: "Above all things -- *keep complete records.* When you have an adjustment that works make a complete record of the setting of every clip and condenser ... if the plate is running red-hot put *that* down. If the antenna is brushing or the condenser insulation smoking

put that down, too" (did the latter really happen?). To stress the original nature of the work, Kruse advised readers to not pay too much attention to information published about the new bands, and added: "The way to get somewhere in this shortwave business is *not* to trail after someone else but to make a trail of your own." While the power limitation allowed operation at levels in excess of the usual QRP limits, the point is that high power was excluded from participation in the activity.

A good indicator of the extent to which low power work had caught the attention of amateurs is the frequency of references in *QST*'s 'Traffic Dept.' divisional reports. While most of the material there is as boring and pointless as that found in current *QST*'s, it is clear that SCM's found low power achievements 'good copy'. For example, the January issue, representing activity up to about November, 1924, included the following notes: "*6AMM heard in N.J. on 80m on 10 watts; 6ADB using 5 watts ... 6AME -5w ... 6BAA, 6ZAZ/6EX, 6BUF on 80 w. 10 watts but no DX yet ...6CLU, 6DG using 10w. on 80.*" Only a few 250- watters appear at this time, and many amateurs use the 50-watt tubes in their transmitters. The Virginia, Alabama, and Georgia report included: "*3CKL (VA) worked 6AXD for 2 hours on 5 and 10 watts in the late morning hours on 75m ...4SB uses both 5 and 10 watts and the 5-watter on short waves works circles around the 50-watters on high waves. 4SB and 4FS work the 6th district regularly, each with a 5-watter -- a two-way transcon [transcontinental] route! ... 5ADA (AL) is strutting his stuff with a repaired 5-watter [yes, they repaired tubes in those days!]). 5NL is an old timer returning to the fold and has already crossed the pond with 10 watts.*" From New England: "*1BDH is to change to 50w soon. He has received two cards [from SWL's] from Belgium on the 10 watts he is using ... 1EF with one 5-watter on 76 meters, has worked the 2,3,8,9 districts ...*" Again, it must be borne in mind that the power rating practice was inconsistent, and some of the references found in these reports could indicate inputs of up to 40 watts, and still be perceived by contemporary readers as low power. In several reports, Kruse's observation that a mass-migration to 80 meters had occurred during the fall of 1924 is substantiated by SCM reports, where, for example, one noted: "This is an all-80 meter district, as everyone has moved down to that wave."

Results from the ARRL-conducted "20 Meter Daylight Tests" began to appear in the February, 1925, issue and began to reveal the peculiarities of that band. The lead article in that issue summarized the work of pioneer John L. Reinartz (*1XAM*) who was to formulate his data into the 'new' propagation theory, as we've seen in Chapter 2. In the February, 1925, report, the centerpiece contact on 21 meters was a QRP contact between *1XAM* and *9EK* lasting from 1525-1630 EST. The signals "suddenly faded" at that time. During the contact, *1XAM* dropped power to 16 watts input, while *9EK* went down to 8.5 watts, and they maintained contact at that level for a considerable portion of the contact. The *1XAM-9EK* QSO was achievement enough, but the "icing on the cake" was that the entire QSO was copied solidly by *6AJF* on the West Coast! In those early days, reports of reception by amateurs or shortwave listerns [*SWL's*] were as important as two-ways, and *6AJF* responsibly telegraphed Reinartz of the reception, following up with the usual detailed letter later. The two-point transcontinental reception of his signals, of course, provided Reinartz with an extremely valuable insight for his propagation theory.

Along with this obvious QRP triumph, another staff writer drew attention to QRP DX successes in "Super DX", where he remarked: "*To us the most fascinating angle to this international DX game is that it isn't a rich man's sport and it doesn't take an expert. It's wide open to everybody. The lowest-powered transmitters in the country are heard as far as the big watt-eaters ...*" Again, the *QST* support of low power work is quite clear. The IARU report for this issue praised Belgian

b4YZ for being the first station from that country to cross the pond by working *c1AR* of Halifax, N.S. *b4YZ*'s power was given as 9 watts input. In Chile, *chFAL* was reported as having worked *z4AG* (New Zealand) and a "snag of S. Americans" on 72 meters using the 5-watt UV202 tube. A note appeared in the Brazil section about the Hamilton Rice Expedition on the Amazon and the fact that base station *WJS* at Boa Vista, after having appeared without warning, had been working U.S. stations and passing expedition traffic regularly. As yet, U.S. amateurs had no idea of the fact that *WJS* was operating a 50-watter, and the field station was running under 20 watts input with 201-A's. A later note indicated that "*WJS*, the station of the Rice Expedition, and its various field stations, *UR, UB, LW*, are being heard all over the U.S. and Europe. It is also being worked by a great many." The call-letters given for the single field station apparently were simply incorrect copy, since only the call *LR* appears to have been used. It would be almost a year later that U.S. amateurs would learn of the power levels used by these stations, as we will see later.

While no QRP feature items appeared between February and May, 1925, one interesting 'Stray' showed up in the May issue: "*It ain't always the power hog that hops the gap. 50V works a2YI (Australia) using a single 5-watter. And 1AAP worked z1AC (New Zealand) using a couple of 202's [5- watters], while 2CPO worked a3AL using the same power.*"

II. QRP Records and the Jewell QRP Contest

"...without the blare of trumpets or the vaunting of banners
the low power work has carried on..."

"The Low Power Report" of June, 1925, is a significant milestone. Hatry and Kruse had been emphasizing the relevance of QRP techniques to low-loss design and construction and operation in the new shortwave spectrum. While the May and December, 1924,'Low Power Reports' left something to be desired as far as final proof that these techniques worked, the June 'Low Power Report' left little doubt about the subject. The list of 'records' published in that report consists of 15 genuine QRP, or better yet QRPp (very low power) contacts, all of which (except one) occurred with *under two watts input.* The list showed the results that could be obtained through efficient practices even without moderately low power, and these accomplishments would be noteworthy even today.

Hatry's opening and concluding comments are in a low key, without the earlier criticisms of the QRO 'ether-busters'. The data itself is the criticism. Apparently Hatry attempted to place these results in the context of recent articles appearing in *QST* which featured the great DX accomplishments of the day and made much of them, as we've seen. He began: "*Without the blare of trumpets or the vaunting of banners the low power work has carried on. The list below shows a number of interesting accomplishments.*" Indeed, as we've noted, the low power work had been relegated to sectional reports and received no front-page publicity since December, 1924. Hatry's concluding remark is quite curious in terms of the scene of the previous half-year: "*How about it fellows? We lead the world in amateur high-power transmission, can't we also lead them in low- power?*" Hatry can only be speaking 'tongue in cheek', for earlier articles were emphatic about one point -- American amateurs indeed led the world, but only in regard to the ridiculous amounts of power they generated! All the great DX achievements were performed by foreigners; recall K.B. Warner's blast in the December, 1924 issue: "*Get ready for a shock, gang. The laurels in this little old game of amateur radio no longer belong to America. We're barely in it ... Wake up fellows. Maybe we started amateur DX, but we're not in it with these chaps ...*" Nothing had happened to modify the scene that Warner described and Hatry knew it: the entire *QST* staff knew it and was apparently quite demoralized by the situation. America was

barely in the game as far as 'records' were concerned. It seems that Hatry's remarks in combination with the low power list suggest that the QRP operators were now leading the effort to reclaim some of American amateur radio's tarnished prestige. And indeed, *QST* would provide ample coverage for their efforts in the subsequent year.

Low Power Report, *(QST, June, 1925)*

Call	QTH	QSO'd	Date	Miles	Volts	Watts	M.P.W.
*h9AD**	Geneva	*1PL*	1/1	3800	200	?	?
g5SI	Englnd	*1PL*	2/15	3800	250	1.95	1700
5AQW	Okla.	*5AJH*	3/24	300	20	0.05	**6000**
8KW#	N.Y.	*1YB*	3/16	355	60	0.6	**570**
8KW#	N.Y.	*9BPW*	3/2	600	50	0.4	**1500**
8KW#	N.Y.	*5ZAU*	3/3	1137	80	1.2	**960**
8KW#	N.Y.	*8BAU*	3/9	320	34	0.2	**1500**
c1AI	N.B.	*g2NM*	2/28	3100	300	12	**258**
7HB	Ore.	*7FT*	2/7	260	60	0.3	**870**
7HB	Ore.	*7FT*	2/7	260	12	?	?
8DOC	Ohio	*6CGO*	1/25	1687	160	0.48	**3375**
9CGL	Ind.	*9DMS*	?	1.25	7	?	?
1VC	Mass.	*1AZD*	1/13	6	1.5	0.003	**2000**
8ATZ	Ohio	*8BRD*	12/14	260	120	?	?
9CDV	Minn.	*4SB*	9/23	1525	80	0.72	**2120**

*Switzerland; # - 40 meters, others 80 meters.

The June, 1925, list was selective and excluded an unspecified number of entries on grounds of lack of data, illegibility of writing, or because the transmitter used was conductively coupled [*illegal by then*]. One clue to the ratio of listed vs excluded entries may be found in Hatry's comments about Edwin Miller, *8KW. The list includes four 8KW* contacts, but Hatry noted that "*Between March 1 and March 14th (1925), he worked 29 different stations at distances between 300 and 1100 miles. All this was done with a 201-A tube and using plate voltage between 34 and 90 and with no input greater than 1.7 watt.*" Certainly, *8KW*'s excluded contacts established better 'records' than several of those on the list. Would that Hatry had included all! Even more impressive are three contacts not shown on the list for *8KW*: "*Mr. Miller did not stop with low power transmitting antenna, he tried it with a small loop. In two days he worked 2WC, 1YB, 1II and 1CMX with an input never greater than three-quarters of a watt.*" The distances involved are about 300 miles minimum. The miles per watt record for the *1YB* contact was given as 570. The report included a schematic of *8KW*'s transmitter and loop antenna, which measured 5.5ft on a side and was wound with 3 turns of 1/2 inch copper ribbon, inductively coupled to the oscillator coil through a 2-turn link and series capacitor in one side of the feed line. Interestingly enough, the loop winding figures out to a 66ft wirelength, a half-wave on 40 meters where the contacts occurred. One is forced to wonder at the sober tone with which Hatry relates an exciting accomplishment; he just didn't understand its magnitude! With respect to *8KW*'s 'big' antenna, a 30ft counterpoise at 30ft height inside the attic was worked against a 50ft wire at a height of 25ft outdoors, a linear antenna about 10% longer than a dipole, and fed approximately at the same point that was used in the Windom antenna several years later.

Except for *8KW*'s portion of the list, the remainder of the contacts occurred in the 75-80 meter band. The phenomenal aspect of the list is its three transatlantics between *h9AD-1PL, g5SI-1PL,* and *c1AI-g2NM.* That these operators, even though running slightly more than 10 watts input, were able to span the Atlantic using antennas similar to *8KW*'s is amazing! *c1AI*'s 40 watts makes him the 'high

power' entry on the list. But these and the other contacts suggest that American amateurs were improving in at least one respect -- receiving capabilities, since the list undoubtedly included many weak-signal contacts! Obviously, when Hatry complained in the December, 1924, 'Low Power Report' that not enough work was being reported upon, he had very little insight into the actual odds against which he and his colleagues were working! Today we know those odds, and we can only admire the accomplishments of our forerunners done with primitive equipment. We can learn something here: as Kruse pointed out in announcing the Cooper Cup, authoritative observations about what can or cannot be done should be ignored, and the QRP operator should try that 'million to one' shot every time! Many have, and some have succeeded!

The major portion of the June, 1925 'Low Power Report' was devoted to technical matters. With respect to operating techniques, Hatry advised:

> *Another thing useful in doing low-power work is picking out the proper time and wavelength for it. At one time the writer experimented with receiving tubes with B battery plate supply and found that best results could generally be obtained in daylight for short distance work and between 3 A.M. and daylight for distance work at night. The sole idea is to hit on a period when the air is least occupied and there is best chance for a weak signal to make itself heard. Pick out a wave [frequency] that is freest from QRM, no matter which of the wavebands you work in. This is about 150 meters in the 150-200 meter band, and no particular wave in the 75-80 band. In this latter band it is a question of finding a time when there are fewest hams on the air.*

We are quite familiar with Hatry's suggestions, although the wavelengths are for the most part unapplicable today. Note that Hatry was sharing his personal experience, and not quoting from authoritative sources -- there were none. Efficiency, further, was a major concern, and Hatry advised the use of triple cotton covered bell wire for winding inductances, as well as noting that small receiving mica capacitors serve well in the low-voltage QRP transmitter circuit. A method of resonating a QRP transmitter without aid of a meter was described in which headphones are inserted in the B+ lead and the tuning capacitor and inductive coupling adjusted for a "click" indicating resonance. Finally, the need for power measurements was stressed. With regard to future entries: "*Reports covering plate voltage greater than 45 that have no information on the input in milliamperes to the plate are useless unless extremely long distances are covered.*" Inputs at 45 volts, the cutoff level, are typically on the order of 750 milliwatts. Hatry was talking about *real* low power, even in comparison to our present 5-watt output QRP standard. and the magnitude of achievement that he was setting as a goal is mind-boggling: the *g5SI-1PL* contact was listed at 1.96 watts input (although my computation shows 2.25 watts) -- that they even made contact on 75 meters is phenomenal!

By the time the June, 1925, 'Low Power Report' appeared, the commercial broadcasting sector had been alerted to the feasibility of shortwave communications. *Radio Broadcast,* the industry trade journal, carried an article in the June, 1925, issue summarizing the achievements of amateurs in developing the shortwaves. John L. Reinartz, *1XAM,* and F.R. Schnell, ARRL Traffic Manager, were featured for their work, and praised as well as the ARRL: "*Members of the organization have communicated great distances using short wavelengths and very low power.*" Schnell had been commissioned a Lieutenant in the U.S. Navy to supervise shortwave tests during the summer of 1925 aboard the *U.S.S. Seattle.* While the 'low power' referred to in that article is on the order of 200 watts, readers of *RB* would be introduced in later articles to genuine QRP work as indicative of radio amateur activity that had been mentioned in previous articles such as "New Paths For the Short Waves".

With the October, 1925 issue, QRP's brief heyday arrived in full glory in the announcement of the "**Jewell 1926 Low Power Contest**", both in the activities section, and in a full-page advertisement taken by the Jewell Electrical Instrument Company of Chicago, Ill. The company was one of the leading manufacturers of electrical instruments, and advertised regularly in *QST*. The company's motivation in establishing the contest is not exactly clear. It can be noted that the contest was great advertising, as can be seen in the full-page ad: "And to measure the input Jewell instruments continue to be found the mose[t] reliable, accurate and dependable instruments for the amateur." But the rules and concepts underlying the contest suggest a motive more altruistic than mere publicity for the company's products. Whatever the case, this was no 'paper awards' contest! Jewell backed up its attempt to emphasize efficiency with a quite expensive, prestige grand prize consisting of a "splendid 21-jewel watch with a solid white gold case and a Lord Elgin movement", a top-of-the-line timepiece! In addition to the grand prize, antenna ammeters were to be awarded to sectional winners in the U.S. and Canada, and Jewell supplemented its full- page announcement with a *direct mailing to all licensed amateurs* in the U.S. and Canada!

Regardless of the Jewell Company's motivation, the contest certainly benefited American amateur radio in that it emphasized the principle of efficiency as supported by Kruse and Hatry, as well as other *QST* authors and staff. Efficiency, in their terms, meant attention to details of construction in combination with accurate measurements of input power. In the *QST* staff-written announcement which appeared in the same issue as the ad, emphasis was upon efficiency: "In addition to having a good chance at a splendid trophy [*the engraved watch*], you have a lot of *incentive to make the low power set as efficient as can be* and you all have a chance to have a whale of a lot of fun." The measurements requirements were quite stringent. Each entry had to be notarized, providing all details of each contact submitted "together with power input readings. These readings must be witnessed by another person who must sign an affidavit and both the owner and the observer swear to the correctness of the affidavit before a notary public." These stringent requirements seem clearly to be modeled upon the procedure followed by *a2CM* in his world record contact. To back up the veracity of claimed records, the Jewell Company reserved the right to have instruments used by entrants checked for accuracy in Jewell laboratories. Obviously, the company wanted any possible record to be unquestionable as well as to emphasize measurements accuracy and to insure that the watch was not fraudulently obtained by an undeserving individual.

A concept of "total input power" was applied in the rules: "*The watts input is to be considered as the total power to all of the tubes used in the transmitter (master oscillator, oscillators, or power amplifiers); filament and plate inputs must be measured by means of filament voltage and current and plate voltage and current meters.*" This concept in part arises from the fact that the two-stage transmitter circuit (oscillator and amplifier) had recently appeared in an article in mid-1925 as a means of solving the frequency-stability problem; hence, the total input power would take into account any r.f. feedthrough to the antenna from an oscillator stage. The scoring for the contest was designed to offset the 'freak' contact, calling for a minimum distance of 300 miles per contact, backed up by an 'averaging' approach: "*In order that no freakish work ... be considered, the average of three records transmissions [sic] of separate messages to different points will be taken as the record distance.*" The rules for the contest reflect a high degree of concern for technical detail, and the impact of this concern in combination with the valuable prize must have increased the American amateur's awareness of the subject of efficiency.

Finally, the announcement stressed the popularity of QRP operation and its appeal to the 'less than wealthy': "*Low power records are being made and shattered almost every night. Now is the chance gang! ... No matter whether you have a UV-199 or a UV- 204-A you have just as much of a chance as the next fellow.*" One wonders how extensive the making and breaking of records actually was at the time. In any event, a comment in a later article by Rufus B. Turner suggests that everyone was in the running for the grand prize [*'the Elgin biscuit'*] during the winter months of 1925- 26. Incidentally, the 'Jewell Low Power Contest' was also announced in the *Radio,* October, 1925, issue in a short note.

As if to add further emphasis to the feasibility of working great distances with QRP, the IARU report was jammed with references to QRP successes by DX operators. W.G. Dixon, British Section Secretary, reported: "*Several New Zealand and Australian stations have been worked on low power and a series of tests show that it is possible to maintain good communications under favorable conditions with a power input of less than 30 watts. In one instance, on July 22 (1925) g2LZ worked z3AL when the latter was using only 2-1/2 watts input, which represents 5000 miles per watt.*" The note does not specify whether the contact took place on 40 or 20 meters, although later comments suggest that it was on 40 meters, since a detailed account is given of work on that band. Also mentioned is that fact that *g2NM*'s low-power "fone is now getting out well." Further, "*g5SI has been doing some wonderful low power work and has succeeded in lowering his previous record with u1PL (U.S.). On July 25 (1925) they hooked up again and were in communication with an input of only 0.64 watt. The same day g5SI repeated this feat by working u1CMX on the same input.*" This work took place on 45 meters. *u1PL* must have been quite the operator, as he continually appeared as the U.S. end of QRP DX contacts. In this case, the distance was about 3300 miles, for a record of 5150 miles per watt. While the report from Robert Andureau, *f8CA*, Secretary of the French section, is not as impressive as the above, it included moderately-low power work (65 watts input) between *f8BV* and *f8QQ*, and New Zealand and Australian stations. At the 30 watt input level, *f8BV* worked *bz1AB* (Brazil), while a two-way between *f8RDI* and *bz2ST* was noted also: "With an input of only 20 watts *f8RDI* worked *bz2ST* on a wavelength of 37 meters. At the time *bz2ST*'s input was 26 watts." And finally, Andureau closed the report: "With an input of only 30 watts, *f8ALG* has had two way communication with *z2AE* and *z2AC* regularly." The foreign operators, in short, were spanning the oceans with low powers, clear proof that high powers were not utterly necessary for DX work.

Keith Henney began his initiation of longwave *Radio Broadcast* listeners into the mysteries of shortwaves and amateur radio in the same month as the above material appeared in *QST* (October, 1925). In his "High Radio Adventure -- On Short Waves", Henney noted that a "*goodly number of advanced broadcast listeners are becoming more and more interested in what is being done on the other communications bands than the broadcasting and this article presents some of the romance of that new territory for radio exploration.*" The article appears to have been an attempt to recruit amateur operators from the ranks of the BCL's by painting a glowing picture of the amateur experience. It does that very effectively:

> *Adventuring into the radio region below about 1500 kilocycles (200 meters) is like exploring unknown territory. It is impossible to say what will be found there and no guess is too wild ... DX exists there that is undreamed of on the longer waves ... there are few civilized nations whose radio citizens are not in personal touch with other foreign countries ... Below 1499K.C. (200 meters) is a paradise in which nationality, language, and distance are of no importance, nor is a limited pocketbook an excuse for staying away from the most interesting region*

of radio. There is the record of the Massachusetts boy who spoke to a fellow amateur in Australia with a lone 5-volt receiving tube which cost him $3.00.

Unfortunately, Henney omitted the identity of the boy, and there appears to be no report of this contact in *QST* -- the contact would certainly have ranked among the top QRP exploits of the day! Like Kruse and Hatry, Henney was fascinated by the astounding distance which could be traversed with low power on the shortwaves. Beginning in the November, 1925, issue of *RB*, he devoted space to low power activities in a series of feature articles, which we'll review below. One wonders how many BCL's Henney seduced into amateur radio, for his style is florid and exciting. And more importantly, the picture that he painted was one of the QRP operator and his particular approach to the hobby. The series of articles that he published were excellent publicity for QRP.

We've already alluded to the first of those articles appearing in the November, 1925, issue of *RB*, "What Do We Know About Short Waves" in Chapter 2. In that article, Henney raised the basic question, both in the text and as a block-capitals section heading: **"WHAT RELATION EXISTS BETWEEN POWER AND DISTANCE?"**, and devoted about half the article to the low power accomplishments of the *RB* experimental station *2GY*. The commencement of QRP experimentation at *2GY* occurred through the same type of 'accident' that led many into the QRP ranks in recent times. He related:

When the 50 'watter' suddenly burned out, a 5-watt power tube was installed in its place and with about 40 watts input to the plate, the same range was obtained as with the larger tube. At night several communications were carried out with very low power. Notable among this work was that done with 4JR in Gastonia, NC, and 4KW in Jacksonville, FL. With the latter station communication was established when about 25 watts were used. Then the plate voltage was steadily reduced until finally only 100 volts were used with a plate current of 12 milliamperes. This represents a power input of 1.2 watts -- and still 4KW answered all of the questions that were sent to him from 2GY. In other words, successful and reliable communication had been carried out with a power-mileage ratio of more than 800 miles per watt ... A still better record is the work with 7UZ, Seattle, WA, two days in succession with a power of 5.4 watts. Station 2GY has communicated with a number of amateurs who were using receiving tubes for transmitters.

These latter stations, of course, would be real QRP types. The initial record of 800 m.p.w. was a good start! Henney also briefly mentioned the phenomenal exploits of Col. Foster, *c9CK,* which we'll review in detail below. He apparently sought out the story about Foster's exploits for a later issue of *RB*.

Henney's emphasis upon the reliability of low power communication corresponded to the Jewell Company's concern -- it was a general concern about amateur exploration of the shortwaves. Henney expressed the belief that the 800 miles per watt record could be bettered if the contact was limited merely to the exchange of signal reports, since the *2GY-4KW* tests involved the exchange of complete messages. The article ended with an invitation to readers to join the *RB* staff in exploring the power vs. distance relationship: "*The Staff would like to hear from amateurs who have records of successful low-powered transmissions especially when the time of day, distances covered, and power used are known. If communication is attained on very low power, it is suggested that a long message, copied perhaps from a magazine, be transmitted and checked back to see whether the communication was sufficiently dependable for the carryiing of traffic.*" Henney's invitation to amateurs to join the QRP effort came almost two years after Kruse's initial call for such activity in the 'Station Efficiency Contest'. Henney kept abreast of *QST* and probably knew of the QRP efforts being emphasized there. Perhaps he felt that the effort needed a 'shot in the arm' because nothing significant had

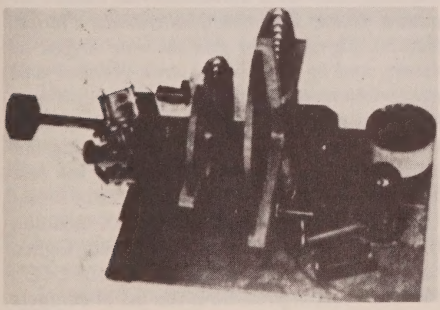
appeared since the June issue. Whatever the explanation. Henney was genuinely interested in low power work.

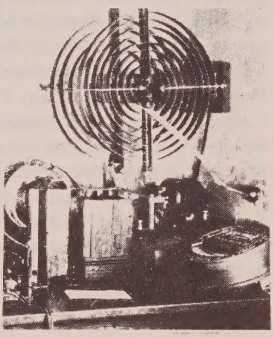
III. *QST*'s 'Special QRP Issue'

"...Foster took a long chance and called him and experienced the usual thrill when a3YX answered him..."

The December, 1925, issue of *QST* was the high-point of publicity for QRP. In fact, it could be considered the first (and last!) 'Special QRP Issue' in the journal's long history, for three separate QRP feature articles appeared in it! Kruse apparently obtained the kind of material that he had been hoping for during the previous two years, and probably couldn't resist the temptation to add his jab at the QRO boys at the end of Burton Synnott's (*2BBX*) description of his QRP work in "Low Power Station *2BBX*". After Synnott's listing of contacts made between July 1, 1925, and August 9, 1925, Kruse added a parenthetical ending to the article: "*(How does that look to you fellows who are using 50- and 250-watt tubes with an input of 250-2500 watts? -- Tech. Ed.)*." *2BBX*'s article is a masterpiece of the concern for detail that Kruse had been pushing in the guise of the New American Amateur for two years, and *2BBX*'s successes with his emphasis upon efficiency proved the value of Kruse's ideal. And *QST*'s Technical Editor was not above mocking those who continued to rely upon brute power in place of efficiency. Bravo Kruse!

2BBX's **QRP Transmitter.** *The 'pancake' coils are visible in this poor photo. The inset (right) provides a clearer view from another transmitter.*





In the article, Synnott provided details about his antenna and receiver, and complete construction data on the low-loss transmitter. Low-loss and efficiency were the basis of his approach. The single fine point noted about the receiver is Synnott's method of obtaining bandspread: "A dial with a *long handle* attached controls the tuning of the secondary circuit. With the leverage afforded by the long handle it is possible to tune extremely finely and that is what is needed to help find a weak 'DX' signal." The handle thus described parallels the front panel and was used to rotate the tuning knob, or in other words, was used to tune the frequency of the receiver. This is still a good trick to use with portable gear in which no space is available for a vernier dial. *2BBX*'s antenna was nothing spectacular, consisting of an inverted 'L' with a 30ft horizontal, 45ft vertical, radiator, and a suitable counterpoise indoors. Low-loss techniques included spacing the vertical portion of the radiator 10ft from the house and using Pyrex insulators throughout, and Synnott commented that this approach "is one of the real reasons for my successful work on low power."

The most detailed treatment was reserved for the transmitter, a Hartley oscillator utilizing a UV210 '10-watter'. By this time, the superiority of a pure d.c.

note had been widely accepted, and Synnott used a full-wave 'S-tube' rectifier and 'brute force' filter consisting of a homebrew 12-henry choke and 2mF and 34mF filter capacitors. No wonder! He noted: "I have no trouble getting a pure D.C. tone". Both plate current and filament voltage were metered. The inductances were low-loss types, wound in the flat '*pancake*' style from 1/2 inch copper strip. The choice of the spiraled flat inductance was aimed at permitting direct soldering of the grid-leak resistor between the center of the flat coil and tube grid terminal: "This way of shortening the grid circuit lead ... is an important factor in the set's efficiency." Similarly, bypass-capacitor lead lengths were kept to a minimum by soldering them directly under the tube socket, while the plate blocking capacitor required only a 4- inch lead to reach the outermost end of the pancake inductance. Synnott sounds almost like he is speaking about solid-state circuitry! In tuning the transmitter, a hotwire ammeter was inserted in the antenna lead, but once the circuit was peaked, the meter was "placed in my curiosity chest, i.e., 'junk box'. Why use the energy grudgingly bestowed by a hard working tube, to heat a piece of resistance wire, when it may be better employed to heat the magnet windings on a New Zealander's phones?" Indeed! Finally, a wavemeter was kept right at the transmitter to insure that the tuning process resulted in maximum r.f. energy output on the desired frequency, with all 'prominent harmonics' eliminated. Signal purity was another principle of efficiency that Kruse emphasized, and Synnott employed it fully.

Synnott's painstaking attention to detail resulted in fairly impressive results for the 10-25 watt input range used, especially considering the fact that the work was done on the 40 meter band. He summarized: "*This transmitter has worked all of the U.S., Porto Rico, Mexico, Canada, Cuba, England, Netherlands, France, Italy, Hawaii, New Zealand and Australia. Signals from this set were logged in Brazil, Belgium, Germany, Poland, Azores, and by ships in the Artic, Atlantic and Pacific Oceans, not to mention all the 'near' hams who sent me cards from all over the world.*" Synnott was not exaggerating -- his QSL collection stood at over *2000* received at the time of writing the article! This guy really got out! Singling out some special contacts, he noted one interesting transcon: "*I consider my best daylight 'DX' work as being 6CHS (CA), who was worked for 21 minutes in broad daylight on 40 meters, July 5th, 1925, with only 22 watts input.*" Real DX included *a2BC* and *z4AR*, who "were worked for over twenty minutes on different nights, with the same power [*22 watts*]". Further, three 6th district listeners sent QSL's for daylight reception of his signals. What is most impressive is the list of contacts in a final section with the heading: "And The Proof!", Kruse's sentiment, no doubt. The list included stations worked between July 1, 1925, and August 9, 1925, and excluded the 1's, 2's, and 3's that were worked. For daylight results, four 4's, two 5's, one 6, and two Canadians were on the list. Night results are more extensive, showing ten 4's, eight 5's, twenty-three 6's, and one 7th district station. Three Puerto Ricans and five Canadians appear along with other DX such as Cuban *2BY*, Mexican *1K*, English *g5BV* (another QRP operator!), French *f8BF* (QRP!), New Zealander *z4AR* and Australian *a2BC*. Little wonder that Kruse felt safe in mocking the 'ether-burners'. *2BBX* worked!

Along with Synnott's description of his station, another article detailing the construction of a low power transmitter appeared in the December, 1925 issue. In "An Inexpensive Low Power Transmitter From Receiving Parts", Rufus B. Turner provided complete construction data as well as photos and operational hints. In introducing the unit, he noted that thousands of American amateurs operate such QRP gear with great success. The unit was built around a 5-watt tube and is similar to Mason's unit in the September, 1924 issue. The number of low power circuits described during 1925 was sufficient to require a separate section in the annual index "Transmitters -- Low Power", which included 10 entries, and con-

tinued to be indexed through the later 1930's. Turner's unit, further, was offered as a complete kit by a New York firm in an announcement in the May, 1926, issue.

The third QRP feature of the December, 1924 issue, "Speaking of Low Power Work", described the phenomenal QRP work done by Colonel Clair Foster, *6HM*, who worked about ten Australians while operating a 201-A from a portable location on Vancouver Island, B.C. Foster's story was related by John M. Clayton (*1DQ*), Assistant Technical Editor, who assumed a rather lack-a-daisical *'ho-hum'* stance in narrating incredibly exciting achievements. A later account of Foster's work appeared in *RB* and the excellence of that account totally overshadows the piece by Clayton, as we will see. In comparing the two versions of Foster's story, it is easy to understand the Editor's lament of several months earlier regarding recent publicity received in the newspapers about an amateur success in a disaster-communications situation which *QST* had reported in detail about a year earlier. *QST* writers (Kruse excepted) rarely managed to turn a collection of facts into exciting human drama! For example, Clayton tells of the first QSO between Foster, operating as Canadian *c9CK*, and Australia in these terms: *"The first signal heard was a3YX, in Sydney, Australia. Colonel Foster took a long chance and called him and experienced the usual thrill when a3YX answered him. Five watts -- Canada to Australia -- 'pretty good work' thought Colonel Foster."* In reality, that rather humdrum 'usual thrill' was more like a burst of ecstasy, for Foster immediately telegraphed news of the contact to New York upon its completion! Likewise, Foster did not merely "take a long chance" in calling this one Australian -- in fact, he'd been doggedly calling Australians for two months before he finally connected! It was an obsession with him to succeed! But, these differences in narrative approach will be quite obvious when we review Horine's version in *RB*.

The transmitter used by Foster was designed by Foster for a 5- watt tube according to Clayton, but a 201-A was substituted instead and run with 275 volts of B battery on the plate. The two stories conflict on this point, since *RB* indicated that 435 volts were available. A picture was included of the transmitter, and Clayton noted that all meters were professionally calibrated before Foster left for Vancouver Island. Two antennas were used. The transmitting antenna measured 3/4 wavelength on 40 meters, where the QRP work was done, and the receiving antenna was a quarter-wave horizontal.

In regard to the work, Clayton related that on August 13, 1925, *c9CK* called *a2TM* on the 5-watt tube, and *"after getting him 9CK switched to the 201-A and, with an input of 14.3 watts, successfully carried on with him for about a half an hour. All this time the 201-A was cold -- not cool, but cold."* During the following two weeks, *c9CK* worked six additional Australian stations with the low power transmitter never exceeding 14 watts input, with antenna current ranging from 235-275 ma. An initial hour and twenty-five minutes contact with *a5BG* resulted in a two week series of nightly tests suggested by Henry A. Kauper (*a5BG*), an Australian DX'er famous in his own right who merited inclusion of his station in the featured stations section of the July, 1926 issue. *a5BG*'s own QRP transmitter would be shown in that article and mention made of his QRP DX exploits. The two maintained the two-week schedule on 40 meters, demonstrating the reliability of QRP long distance communications. Clayton related one interesting incident during the tests: *"As a crowning feat, one night when Foster was working a5BG he used the 201-A in the transmitter both as a transmitting and receiving tube. When he finished working a5BG he took the 201-A out of the transmitter and slapped it into the receiver to copy a5BG's reply! Even Henry Ford would approve of such economy. Two-way communication between Canada and Australia on one $3.00 tube."* In addition to the Australian and New Zealand stations worked,

Foster worked many U.S. 6's and *u2AHM* in New York, as well as "*KFUH, NRRL,* NSJJ, and other ships in Australian water."

A humorous slant to Clayton's narrative occurred in regard to the various theories advanced by members of the Vancouver Island logging camp crew to explain Foster's phenomenal success: "*Colonel Foster himself suggests the simplest solution -- a casual glance at the globe will show that the sgs travel downhill all the way ... the best theory though is the one offered by Bill Sholl, said to be the best cook that ever invaded a Canadian logging camp. The Sholl Theory is that there is a hole in the Heavyside layer right over 9CK and another hole over Australia. The signals from 9CK go through the first hole and slide along above the layer, only to fall out in the vicinity of 'Zs' and 'As' [Australia and New Zealand].*" Humorous, but obviously placing *9CK*'s accomplishments in a rather non-serious context. Finally, Clayton closed the narrative with the observation: "*We would not be surprised if 6HM (Foster) junks the 204-A [his QRO home station transmitter using a 200-watter] tube transmitter since the Colonel has thoroughly convinced himself that for excellent DX a 201-A furnishes ample power provided it is built into a really low-loss transmitter.*" In modern times, Foster would simply sell the QRO rig, as so many converts to the QRP approach have done. And so, the amateur radio world caught its first glimpse of Col. Foster's astounding accomplishment through Clayton's dispassionate perspective. That Foster was capable of spanning the Pacific every night for two weeks, using less than 14 watts input on 40 meters, and engaging in lengthy contacts with *a5BG*, was indeed a remarkable feat!

Rounding out the December, 1925 "QRP issue", the IARU report noted that 50 Australians had worked the U.S. as of October, 1925, with most of them using 5-watt tubes, and that *z7JB* of Tasmania had worked England with 30 watts input. Overall, the December, 1925, issue represents the high-point of publicity for QRP work in *QST*; QRP would recede from the front pages until April, 1926, and then eventually take refuge in the fine-print IARU and divisional reports.

IV. E.E. Horine's Story of Col. Foster: 'A Man and His Hobby'

"...he continued to 'holler his head off' at the antipodes night after night..."

The challenge and thrill of QRP operation emerged in all its brilliance in the feature article about Col. Foster in the March, 1926, issue of *Radio Broadcast* simply entitled "A Man and His Hobby," E.E. Horine's account is a classic in its own right, carrying the sub-title: "*The Story of One Man's Experience With Short Wave Code Transmitters on Low Power -- How Australia Was Reached From British Columbia With Batteries and a Receiving Tube as a Transmitter.*" The author, E.E. Horine (Radio Division, National Carbon Company), revealed a remarkable insight into the essence of the QRP experience and an enthusiastic admiration for Foster, the hero of the story. From Horine's account, we get a glimpse of the world of amateur radio at the time:

Around about 7500kc (40 meters), the air is literally full of signals of all kinds, day and night, summer and winter. It's all code down there. No grand opera stars singing in heavenly voices; no prominent speakers wagging the silver tongue; no jazz. Only a succession of queer sounding dots and dashes, in all manner of tones and pitches, from low gutteral growls to high-pitched, clear, chirping notes. Some of them sound as if they might have originated next door, while others create the impression of having come across thousands of miles of ocean and land; and the chances are they have, for it is an everyday occurrence for amateurs of different nations to converse with each other. The field of amateur radio is the DX fan's paradise, and therein lies a part of the fascination of the game. Listening in on the ham bands stirs the imagination and arouses the curiosity.

Upon first reading Horine's account, I was amazed that he could speak of QRP operation in words similar to those I had written in Chapter 1. Perhaps this is the only way to describe the QRP experience. With regard to Colonel Foster's experience as a ham, Horine presented him as something of a newcomer, having learned of radio only two years earlier. But his curiosity and perseverance in pursuing radio have "*brought him a host of new friends, many of them on the other side of the world, with whom he is on terms of closest intimacy, yet who he has never seen, and probably will never see.*" The hobby itself, which was quickly transformed specifically into QRP operation, "*has afforded him the most pleasant hours of his life, and turned him into a youth again, bubbling over with enthusiasm.*" This undoubtedly is the most inspired expression of the rewards of QRP ever written!

Foster's philosophy and explanation of his radio experience undoubtedly inspired Horine's enthusiasm for amateur radio. But he clearly agreed with Foster's view that "*reaching out to great distances with high power isn't so remarkable,*" and that it is the "*fellow who does it with low power that deserves the credit for real achievement despite the sad fact that this idea of 'miles per gallon' is getting a great deal of attention among amateurs.*" Foster explained his attraction to the QRP approach, and many of us are quite familiar with the process that he described:

> *After working a number of distant stations that were using very low power, my hat came off to the chaps who could put out such clear and steady signals with 5-watters -- and even 201-A receiving tubes. Every one I bumped into I boned for his dope [knowledge], and I have collected through their courtesy quite a bunch of it. I see no especial credit coming to the fellow who busts out with big tubes. Of course it is satisfying to have a wallop so that when you answer a CQ (general call) you are the fellow the other chap almost surely hears; but the big field for the practical use of radio can't be opened up with the use of big, expensive equipment. Only a small portion of those who will become interested in transmission can afford the heavy outlay.*

Behind Foster's comments lay a vision of amateur radio spread among the peoples of the earth spreading goodwill far and wide. It seems that part of his enthusiasm for QRP came from the hope that such a thing was possible and QRP was the only way to achieve it.

With respect to the choice of the low power rig for use during the summer stay on Vancouver Island, the remote location furnished no source of a.c. power, making battery-powered operation necessary, and that led to QRP equipment. Circumstances were married happily to Foster's interest in low power operation, and he conceived the ambition of spanning the Pacific with low power. As Horine put it, "it is a wild, rugged country, remote from civilization, and naturally no electric power available for any purpose. There is only one way to get power in that country, and that is to carry it along in the form of batteries." However, there were other reasons underlying battery-powered operation. In facing the summer in the wilds, Foster prepared months in advance, and studied the factors that could contribute to success. His observations led to one conclusion:

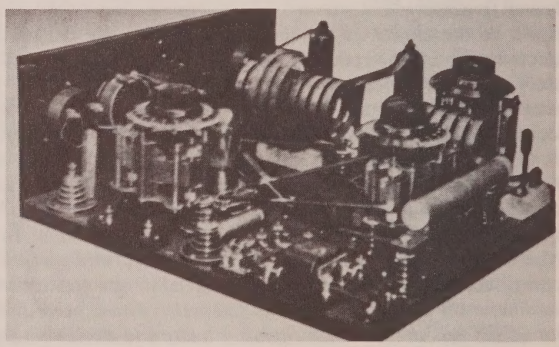
> *Along this line, most of us on 15,000 kc. (20 meters) have been using 250-watt tubes. But 9DFH has the steadiest signals I hear, and he is using a lonely 5-watter (about the size of an ordinary receiving tube) with less than 20 watts input. And recently, I worked 4BL, in Lakeland, FL, who was coming in here fine through heavy static disturbance, using a 201-A receiving tube for transmitting! It wasn't a freak transmission, for 4BL has worked some of Canada, all United States districts, and Porto Rico on 7500 kc. (40 meters) with this tube. At present, the big drawback to the use of 15,000 kc. (20 meters) is that it is so responsive to the slightest variation in current that the signals keep swinging into and out of tune. I think batteries for plate and filament ought to help a lot.*

Apparently Foster had been corresponding with Horine several months prior to the trip, and while the article makes no mention of the reason for their contact, presumably Horine supplied the batteries to be used by Foster; this was not unusual, since several battery manufacturers worked closely with amateur experimenters during this period to demonstrate the reliability of their products during extended portable use. Furthermore, the connection between a pure d.c. steady note and low power success had been noted by this time, and Foster considered it essential that he put out such a signal if he was to succeed in his quest for Australian contacts. Horine explained, for example, that "for weak signals put out by such apparatus to get anywhere, it is essential for the note emitted to have a high penetrating sound, otherwise it can't be read at considerable distances." Batteries provided such a tone, as well as a signal "steady and free from swinging". In praising H.A. Kauper (*a5BG*) for his part in the historic accomplishment, Foster emphasized the characteristics of the battery-powered signal:

> *Am simply lost in admiration of that chap. Just think of the courage displayed in asking for a report that of necessity must be more or less complicated, and knowing that it must come back to him in a thin, high, bird-like note that must take a mighty fine pair of ears to hear at that distance. Only one thing in his favor -- C9CK's note is absolutely steady. It has been reported so all over the map.*

Battery power was the reason. After his return, Foster was so convinced of the importance of the steady note occasioned by battery power that he remarked: "I'm going to keep on using dry cell B batteries for this work even if I have to give up a hundred dollars apiece for them." What Horine describes as the "merry twinkle in his eye" that accompanies Foster's story-telling shows thru in Foster's witty exaggerations!

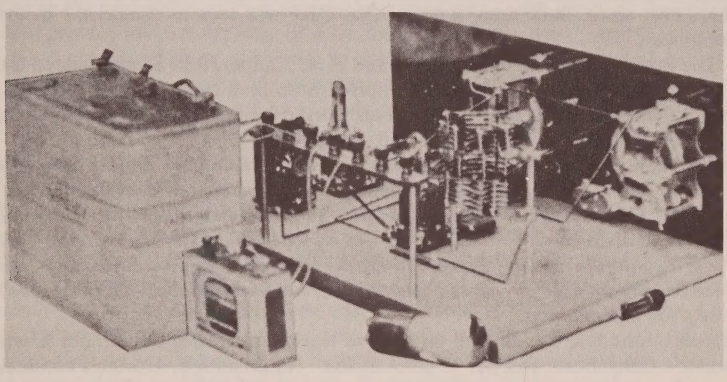
Col. Clair Foster's (*c9CK*) Transmitter. *The unit is built on a woodbase with stand-off insulators mounting the components. The large coils (top) wound with copper strip cause the 'rectified a.c.' note and were replaced by copper tubing coils. The 201-A is seen to the right of the variable capacitor at left.*



Despite planning carefully, Foster was, after all, preparing for a portable operation, and Murphy's Law inevitably applies in such cases. Luckily, Murphy struck far enough in advance to permit rectification (of sorts!) of the problem. Having chosen battery power and operation on 40 meters to insure that his note would be steady and pure d.c., Foster was confronted with a puzzle -- he continually received reports that his "note was rough and ragged, as if produced by rectified a.c." The humour was apparent when Foster looked back on the prob-

lem and noted that he "was kidded over the air about his a.c. batteries." The problem was finally traced to oscillator-coil vibration caused by the thumping of the relay during keying periods. The original coils, wound with 1/2-inch wide copper strip, were replaced with new coils wound from 1/4-inch copper tubing, and the vibration problem ceased. The note was pure d.c. at last, and the transmitter was ready to go! Foster carried along 11 B-batteries (each about the size of the modern auto battery) which provided a maximum of 485 volts for the plate of the 201-A.

Col. Foster's 'Low-loss' Receiver. *Note the widely spaced components and symmetrical wiring characterising the 'low-loss' approach.*



Once Foster arrived at the site on Vancouver Island, antennas were put up for both receiving and transmitting, as noted earlier. Once in operation, c9CK tried his possibilities with So. Californian stations, and received encouraging reports from them, and then dug in to pursue his major objective. But success was long in coming. In one letter to Horine, Foster reported: "*Saturday night I hollered my head off at the Antipodes until 2 A.M.* I imagined batteries would show some drain after all that use. But at the end of that time the eleven in use still tested exactly as when I began, 485 volts." Horine was impressed with Foster's perseverance: "*He continued to 'holler his head off' at the Antipodes night after night without result, until the ordinary individual would have given up and dumped the apparatus, batteries and all, in the lake*" beside the cabin. But he "*kept at it for two months, until finally, on August 11, 1925* [*R12 S.S. Nr: 52*], he scored with a3YX. The contact was a triumph for Foster, occasion for immediately telegraphing Horine: "*Using only one 201-A receiving tube with input just ten watts from Eveready Batteries worked satisfactorily this morning five forty to six forty-five Pacific Standard Time Australian a3YX on thirty nine meters. Report on other work follows soon.*" Indeed the contact is cause for astonishment -- over an hour of solid contact with Australia on 40 meters with just ten watts input! Two days later, Foster repeated the performance with a2TM, and then a3YX a few days later. a2TM's QSL card reads: "*I think that that's the lowest power record across the Pacific. Your signals were fading a lot, but did not drop off much when you changed tubes. I hope to test again with you soon. Will try reducing power myself next time.*" But the big contact came on August 27, 1925, when Foster hooked up with a5BG in what Horine called "one of the outstanding performances of amateur radio." Foster immediately sent the following telegram:

Today again the receiving tube stop this time forty-five minutes perfect communication with 5BG near Adelaide, South Australia stop these signals had to

travel thousand miles or more over land after passing the other three stations worked already with this tube stop input thirteen watts wavelength thirty eight and seven tenths stop more than quarter of distance full daylight.

The distance is over 9000 miles and figures out to only about 700 miles per watt, but the fact that the distance is so great is what made the contact so significant. Horine reacted by noting that "*it is hard to realize that this vast distance was bridged with a little transmitter that any one with a little knowledge of the subject can build at a total outlay of not to exceed $50.00. That's the wonderful part of it. This low power, long distance transmitting is not a rich man's game -- it is within the practical reach of all.*" Horine's portrayal of QRP as being within the common man's economic means echoed similar views voiced by Kruse and Hatry then and others ever since. Back then, it seems that QRP was seen as *democratic* in some special way.

The initial contact between c9CK and H.A. Kauper, a5BG, was indeed a triumph for QRP, but beyond that, it inspired both men to establish a schedule in order to determine the reliability of their work. Horine explained their approach in the following terms:

The mere fact of establishing contact with an Australian station from Vancouver Island, using a 201-A receiving tube, is a notable achievement, but not a record. Other amateurs have surpassed this performance, and while naturally elated at his success, Colonel Foster was conscious that there was danger of his lapsing into the role of joyous ham experiencing a major thrill instead of maintaining the attitude of a cold-blooded observer; for after all this might prove to be freak transmission.

The daily schedule was carried on for two weeks, except for September 2, when Kauper's transmitter was out of commission. (Interestingly, Horine's comments in the foregoing passage capture the two sides of the QRP experience described in Chapter 1, namely, the "joyous ham" personally and emotionally experiencing radio, while at the same time, the scientist present with his "cold blooded observer" attitude investigating the phenomena underlying the radio experience.) After two weeks of lengthy contacts, during which, to Horine's unending fascination, the two distant operators became very close friends who shared all sorts of details about their lives, the schedule was ended, "*not because communication became impossible, but because they had demonstrated conclusively that reliable two-way communication could be established and maintained with extremely low power.*" Foster had only the highest praise for Kauper and his persistence in maintaining the schedule. He commented in such a way as to clearly reveal the reason why they did it: "*Kauper is a wonderful chap. It is obvious that he is keenly alive to the fact that in keeping this daily schedule under actual working conditions Australian amateur station a5BG and Canadian amateur station c9CK are helping to make radio history.*" Indeed they did and will never be forgotten!

In a sense, every time the QRP operator attempts to bridge the oceans with very low power, he is continuing the efforts of Foster and Kauper to make radio history. But their achievement should be put into perspective lest we imagine that we blaze the same type of trail. Both operators were using two-stage receivers consisting of a detector and audio amplifier. They were attempting to do something which had never been done before. They had no understanding of the fact that the *R12 Smoothed Sunspot Number* stood at 52 as Cycle 16 climbed toward its 1928 peak of 78, or what that meant in terms of propagation on 40 meters. As yet, no one realized that there was a relationship between antenna height and angle of radiation, so important in long distance work. In short, they went at it blind. And we modern amateurs, with our KW's and 4 element beams at 100ft complain that Cycle 20 peaked at a miserable 111! It's not that "things ain't like

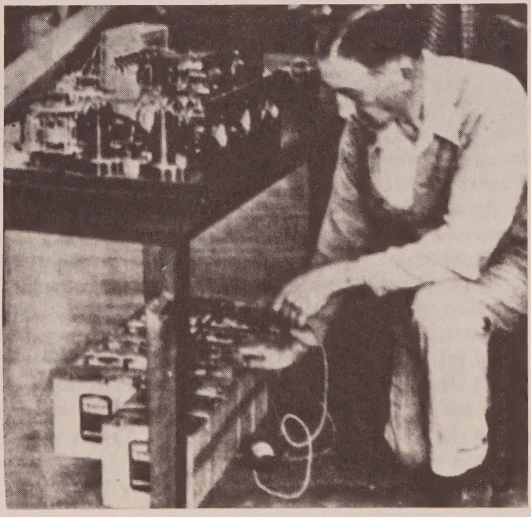
they used to be," it's more like "amateur operators ain't what they used to be." Hopefully, this is not quite true of modern day QRP'rs!

But Foster left us with more than a 'first' in QRP and amateur radio history. He understood the potential role of QRP in the future of human history, and as a thoughtful man, he saw the larger overall picture and the implications of his work in that context. There can be little wonder as to why Horine was so impressed by Foster when we read *c9CK*'s assessment of the meaning of his accomplishment:

> *I feel that in these experiences of mine there is really a big story. You [Horine] know me well enough to know that I don't mean big because I did it. It is big because the infant art of radio did it, and is continuing to do it. It is big because of the far-reaching possibilities it discloses for the human good. Not theorizing as to the probability of long distance communication with extremely low power, but proving the practicability of it by doing it day after day ... And just look at the future possibilities, certainties of this inexpensive low power stuff as a promotor of peace among the peoples of the earth. Why, with all the warm friendships that are being born every day among the radio amateurs of one country with those of another, it will soon be all a politician's life is worth to say, "Let's start something". Just fancy some big stuffed shirts telling me to go out and fight young Kauper!*

Foster, incidentally, was a reserve officer in the U.S. Army. Would that he had been right! But he was dead wrong. And ironically, when the stuffed shirts do "start something", the radio experience that amateurs have acquired by establishing those friendships make them valuable assets in the politicians' war. It seems entirely fitting that Foster, who embodied the ideals of the QRP operator, would also speak out strongly for the ideals of peace among nations. I could easily believe that he was the Old Man himself -- if I did not know that the Old Man had already been invented before Col. Foster arrived on the scene!

Col. Clair Foster (*c9CK*). *Foster tests the bank of B batteries. The transmitter is seen at front of the table, the receiver behind it.*



Chapter 5
1926-27: Newcomers and DX'rs

Zurich R12 Sunspot Numbers: 63-72

"...I want to tell you fellows, that the sound of my own call letters zipping thru my phones was the sweetest music I had ever heard in my life. I shall never forget it during the rest of my days..."

The December, 1925, "QRP" issue of *QST* rounded out its tale of QRP successes in the IARU report which noted that 50 Australians had worked the U.S. as of October, 1925. Most of them were using rigs with 5-watt tubes. Kruse's broadside attacks on slipshod American amateur practices apparently had hit home and the Americans had quickly developed the ability to copy weak signals from 'down under'. But the records still eluded the Americans. *z7JB* of Tasmania had worked England with 30 watts input. Overall, the December, 1925, issue marks the high point of publicity for QRP work in *QST*.

QRP publicity was taken over in fine fashion by Keith Henney in *Radio Broadcast,* but before reviewing the QRP features published there in early 1926, a glance at the material published in *QST* during the same period will be illuminating. The January, 1926, issue included a report from Holland (IARU section) that is of interest: *"The month of October (1925) has been very quiet as far as DX work is concerned. Most of our stations were occupied with QRP tests, reducing power from the average 100 watts input to about 5 watts for European QSO's (1000-2000 miles) and getting better ASL in most cases."* This is apparently the first use of "**QRP**" to designate low power operation at the 5-watt level! January, 1926! Further, we find that *"o6N* is reaching out FB now having made several QSO's with the U.S.A. on low power." In the February, 1926, report, we learn that only ten amateurs in England have government permission to operate up to 250 watts input -- all others were limited to the maximum of 10 watts input! Norway reported a contact between *s1ALA* and *u1YB* of Dartmouth, Connecticut, with *s1ALA* running 15 watts input. In the March, 1926, issue, Rufus P. Turner added an amplifier stage to the low power transmitter circuit featured in the December, 1925, issue, in the article "A Power Amplifier for the Low Power Transmitter". In beginning, Turner noted that *"a great number of transmitting amateurs in this country have constructed low-powered C.W. transmitters, employing a single UV199 or UV201-A receiving tube as the oscillator, for use this winter in the competition for the Elgin 'biscuit' [the Elgin wristwatch] offered by the Jewell Electric Instrument Co. as a prize for record low power work."* Apparently the Jewell Company's direct-mail contest announcement had considerable impact upon the American amateur's awareness of low power operation. The amplifier stage featured in the article provided higher power input (40 watts) than the single stage oscillator circuit as well as much better frequency stability. In the 'Letters' section of the same issue, *u8AJX* described his transmitter briefly in the note "Low Power Dope". A 'Stray' in the January, 1926, issue noted that his 201-A signal had been heard in So. America, and he'd been "swamped with cards and letters asking how the set was hooked up." Apparently the grassroots amateur was as hungry for practical hints from successful QRP operators then as they are now! But while QRP took a back seat in *QST,* it enjoyed a move to the front pages of *RB* through the efforts of Keith Henney.

I. QRP Features and Experiments in *Radio Broadcast*

"...Let's imagine for a few minutes that you are sitting out in the radio shack at 2GY with the operators, about to try the new transmitter ..."

In the January, 1926, issue of *RB,* Nicholas Hagemann (*2KP*) described "A Universal Short Wave Transmitter" which represented a new step in the advancing technology of frequency stability in the low power, single stage transmitter. Hagemann's description of shortwave amateur signals provides a valuable insight into the apparently universal problem:

Any one who has listened to signals on the very high frequencies, on the so-called amateur 40 meter-band, for example, will know that strange things occur there. In the first place, signals do not stay put, but they wobble around, changing in frequency and strength. It is one of the discouraging things about high frequency transmission -- but on the other hand, it is one of the joys, for one never knows what is going to happen next ... among the medley of notes that fill the 7-megacycle (7000 k.c.) band, notes of all sorts, some course and raw, practically all of them varying, a clean steady note is like a beam from a lighthouse on a thick night. It gives the receiving operator confidence, for he knows that the signal will not leave him in the middle of a message.

Hagemann's 'Universal Short Wave Transmitter'. *Note the use of copper strips as connecting leads. The 201-A is at center. Experimental model shown here.*

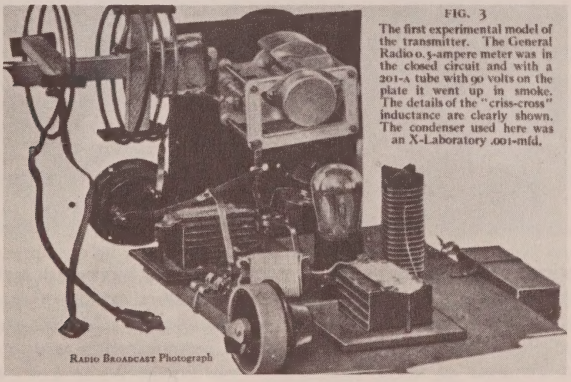


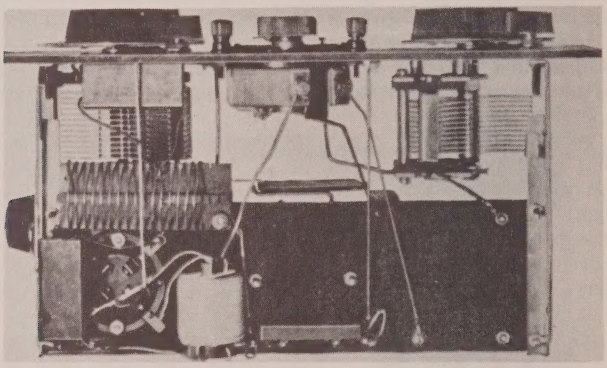
FIG. 3
The first experimental model of the transmitter. The General Radio 0.5-ampere meter was in the closed circuit and with a 201-A tube with 90 volts on the plate it went up in smoke. The details of the "criss-cross" inductance are clearly shown. The condenser used here was an X-Laboratory .001-mfd.

Hagemann then traced the frequency instability problem to tightly coupled transmitter outputs, swinging antennas, and varying filament and plate voltages. The new circuit provided an extremely stable frequency over widely varying operating conditions. Claimed stability is remarkable. In one version of the circuit constructed for 2998-3740 kHz, "*a change of 150-400 volts on the plate of the tube produced no greater change in frequency than 800 cycles.*" Remarkable! The circuit was an adaption of a Signal Corps frequency-measuring instrument. The key to stability was using a very small tuning circuit inductance paralleled by a very large capacitance across the grid-filament circuit. Changes in tuned-circuit total capacitance caused by a swinging antenna and its changing impedance were thereby 'swamped' by the large parallel circuit capacitance and caused little or no effect upon frequency. In addition, r.f. chokes were used to isolate both the grid-filament and the plate circuits, eliminating the instability effects of changing supply voltages. The unit as described in construction notes would function with any tube up to a UX210, including the popular 199, 201-A, and 202 types. Low loss techniques were stressed, with "short, direct, and heavy leads for the radio

frequency paths". The complete parts list, including a pair of General Radio vernier dials (cost = $5.00!!) adds up to $50.00 brand-new, and shows a 500pF variable as the main tuning capacitor. Two-band coverage was possible (80-40 meters) with the components listed. In place of the usual r.f. antenna-current ammeter, Hagemann showed a flashlight bulb shunted by an appropriate length of wire, an output indicator that QRP operators still use today.

In reviewing the performance of the unit, Hagemann noted 100 mile contacts at less than one-half watt input, and all U.S. districts had been worked at the usual 19 watts input to the UX210 tube. For very low power work, a 201-A was operated with 180 volts on the plate. Mobile experiments (stationary vehicle) were also described. The heading for the article announces the unit as a "Five-Watt Transmitter of Extraordinary Range and Steadiness Which Can Be Used With Receiving B Batteries as a Source of Plate Supply." Hagemann's circuit found ready acceptance at *2GY*, the *RB* experimental station, and QRP work done with it was described in detail in the April, 1926, issue of *RB*.

Final Version of *2KP*'s Transmitter.



RB continued its coverage of shortwave low power work with a detailed account of the Hamilton Rice Expedition in the feature article of the February, 1926, issue, John W. Swanson's "Radio: The Jungleman's Newspaper: How the Rice Expedition in the Jungle Maintained Communication with the Outside World -- A Triumph of Short Waves and Low Power When Long Waves and High Power Failed." The setting of the story, its touting of QRP dependability, and the dozen pictures, are reminiscent of a similar article appearing over a half-century later in *CQ* -- the famous "Jungle QRP", Paul Wyse's (OA8V) story of operating QRP from a remote jungle station in Peru. The pictures of the "flying boat", the canoes, natives, thatched huts -- all are the same in both stories. But the difference in technology is obvious!

The Rice Expedition had as its objective the mapping of the Amazonian interior. The original plan for communications was to proceed from Para, situated at the mouth of the Amazon, 850 miles into the interior to Manaos, where the high power longwave station (200 kHz) would provide contact with the outside world. The group would then proceed 400 miles further into the interior to Boa Vista, where the support camp would be established, and the base station *WJS* was set up to maintain contact with the 200 kHz station at Manaos. The advance mapping party, which had to struggle against the wild river, portaging around rapids and often making only one-half mile progress per day, carried with it a 25-watt portable transmitter, originally designed for 100 meter operation.

Swanson's account of the difficulties faced by the mapping party reminds one of the 'headhunters' movies of the 1950's, but the real anxiety was directed at maintaining communications, and the initial failure to establish contact with Manaos cast a gloom over the hoped-for link with the outside world. To add to the problem, the high-power tubes for the longwave base station at Boa Vista quickly burned out, leaving the group only with the low power portable transmitter and a pair of 50-watters at *WJS*, and no contact with Manaos, the intended link to the outside world. Swanson reported their solution to this critical problem:

> *Now McCaleb's short-wave experiments [McCaleb was one of the operators] bore fruit. During the months since the expedition's sailing, the great amateur migration to the 40-80 meter band had taken place (Fall, 1924). So, unable to work Manaos which was, as radio distance measured, but a step away, WJS began shooting Rice Expedition traffic almost daily to American amateurs.*

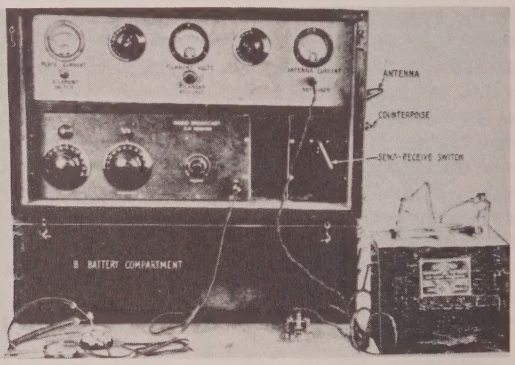
But first, it was necesary that both the *WJS* and advance party station *LR* transmitters be revamped for 40 and 80 meters. An Armstrong receiver was hastily constructed by the mapping party "in the wilds out of camp odds-and-ends including two empty sugar tins" provided by the cook. Despite its haywire construction, the crude receiver "picked up amateur signals from every radio district of the United States, and from several foreign countries." The low power portable unit served as the vital link with base station *WJS*, and hence operation of the unit was reserved primarily for passing traffic to *WJS* from the mapping party. Conservation of the battery supply was a prime concern. However, *LR* was reported as worked by many American amateurs, as we've noted earlier, and McCaleb noted about his own role as operator: "*On occasion, when the operator's curiosity to learn how the low power equipment would reach out got the best of him, he passed a message direct to station 4DO, M.M. Burns, of Atlanta,* GA." Judging from reports of the reception of *LR* noted earlier, it appears that the low power station was being heard widely in the U.S. with good signal strength.

The view of the radio world from the Amazonian jungle convinced Swanson that low power was all that was necessary for successful shortwave work. He reports that "*there was scarcely a night when signals from American amateur stations were not heard on the crude shortwave receiver*" of *LR*. Furthermore, "*the amount of power used in transmission appeared not to be a factor of such importance. Many of the amateurs heard in the forest were using sets with as little as ten watts of* power." The QRN problem in the jungle apparently was tremendous, and required stretching the 30ft receiving antenna one foot above the ground! And yet the U.S. low power signals were getting through! The static would diminish for a "short period just following sunrise when the world could be heard. Sometimes this fruitful interval lasted two hours, often not longer than fifteen minutes." In summarizing his involvement with the Rice Expedition until February 23, 1925, Swanson concluded: "*On the whole, while transmission on the high frequency proved to a certain extent freaky, communication was established over such long distances with so little power that the conclusion seems inescapable that short waves will come to be used extensively in long range work.*" Indeed, the Rice Expedition was one of the expeditions then taking place that opened the eyes of the world to the value of short wave communications -- for the many amateurs who learned of the identity of *WJS* and *LR*, there remained, no doubt, a great curiosity as to whether their particular signals had been heard by Swanson and McCaleb.

The March, 1926, issue of *RB* coverage of QRP exploits featured "A Man and His Hobby" which we've reviewed in Chapter 4. It was an important part of the picture developed in this series of *RB* articles about QRP.

Radio Broadcast continued its QRP series with a report by the staff in the April, 1926, issue entitled: "How a Portable B Battery Transmitter Works--Details of Actual Operation of a Forty- and Eighty Meter Transmitter Using B Batteries for Plate Supply -- How the Record of 26000 Miles per Watt Was Attained." The transmitter was assembled for the purpose of maintaining communications between *RB* headquarters in Garden City, NJ, and Pathoque, Long Island, during the "International Reception Tests" in January, 1926. These tests were conducted annually to determine the extent to which commercial broadcasts were being heard on opposite sides of the Atlantic. Station *2GY* provided the link between the *RB* headquarters and the Long Island listening post, where reception was excellent but no a.c. power was available. The circuit is that described by Nicholas Hagemann in the January, 1926, issue.

***2GY*'s Portable Station.** *The 201-A QRP transmitter with 3 meters is at the top, the receiver in the middle, and the B-battery compartment at the bottom provided 450 volts for the entire station.*

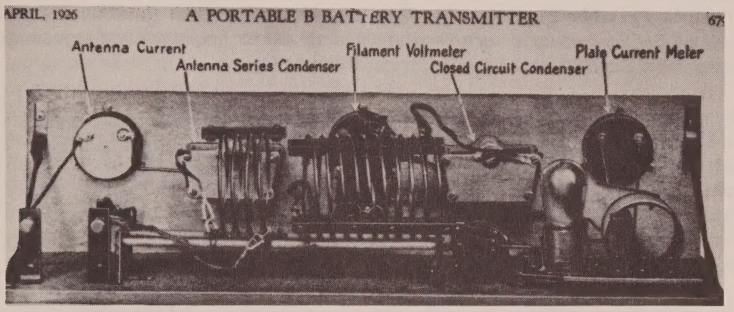


The staff report primarily covered the period during which the portable station was tested between December 11, 1925, and January 5, 1926 [*R12 S.S. Nr: 61*]. Always inclined toward the dramatic, the author introduced the scenario with a literary flair:

> *Let's imagine for a few minutes that you are sitting out in the radio shack at 2GY with the operators, about to try the new transmitter. It is the night of December 11th and Operator Mann is at the key with Bob Blanchard standing by to throw switches and be generally helpful. The air is filled with 40 meter stations, and among them is 9DDE, John Wilcox, Chicago, whom we call without result. Then at 8:15 we send out a 'CQ' which is answered by 9ECC, Floyd E. Wilkins, at Minneapolis. At that time the transmitter tube, a UX-210, was drawing 22 ma at 400 volts. For an hour 2GY conversed with 9ECC, reducing the power with the following results: DC Input: 8.8w, Signal Strength: R4; 4.8w: R4; 0.78w: R3; 0.34w: R2. Not bad for a start! 1000 miles on 0.342 watts -- less power than is taken by the average receiving set.*

The approach followed during the first contact was usually applied during later contacts, first establishing contact with 'high power' (8 watts input) and then QRP'ing to the R1-3 signal level. (The 'R' [*readability*] system is roughly equivalent to our current 'S-units' system, except that reports appear to have been more accurate in those days.) But often *2GY* initially established contact with low power on the order of 1.5 watts. The second noted contact was with *8BZK* in Cleveland, OH, with the power reduction producing the following results: 20w: R6; 12w: R6; 4.8w: R4; 1.4w: R3.

2GY's Portable Transmitter. *Rear view of the low-loss transmitter used to set QRP records at RB.*



A December 16th contact (8:18 P.M.) with *9DCG* at Rockford, ILL, produced signals that "were audible all over the room" with a *2GY* input of 1.8 watts. A December 17th contact with *9CCQ* at Braymer, MO, led to a series of nightly tests between December 21st and January 5th. During the first contact, the power reduction went all the way down to 40 milliwatts input to a "Sea Gull 201-A" tube:

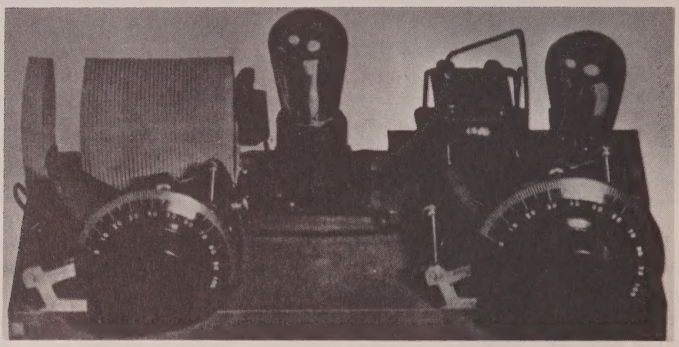
Voltage	Current	Power	Signal
290v	19ma	5.5w	R3
200v	13ma	2.6w	R3
120v	7ma	0.84w	R2
75v	4ma	0.3w	R2
40v	1ma	0.04w	R1

At the 300 milliwatt level, a message was sent to *9CCQ* which he copied perfectly across the 1080 miles separating him from *2GY*. *The record established during the contact was 26,500 miles-per-watt, one of the best 'hung up' by American amateurs to that time.* Included in the article was a list of 16 contacts made with between 0.04 to 17 watts over distances ranging from 700-1080 miles for records ranging from 50.5 to 26,500 miles per watt. The antenna used by the portable station was a single wire "poorly insulated, neither vertical nor horizontal and only about 35ft long." The single wire counterpoise ran in a direction opposite to the antenna and likewise was not insulated. Antenna currents were never over 300 ma. Actually, *2GY* was using an antenna approximating a half-wave dipole, although it was connected directly to the transmitter without feedline.

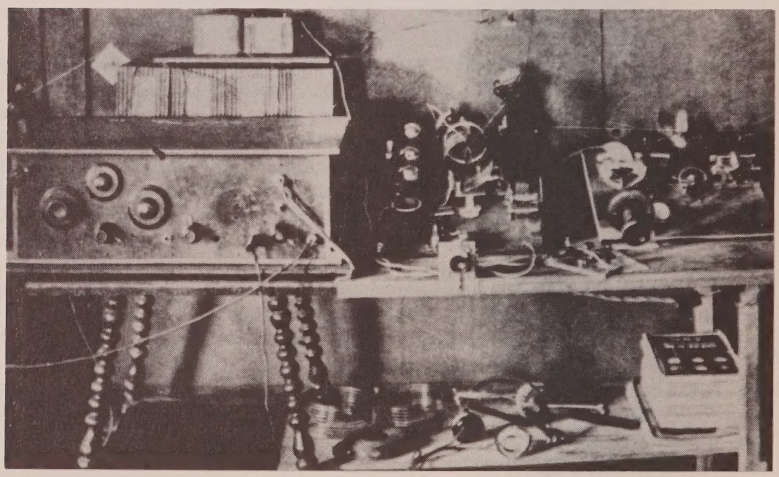
The assessment of the practicality of QRP work echoes earlier comments that we've seen. After describing the antenna system as 'amusing', apparently in contrast to the 85ft-high vertical at headquarters, the author provided his conclusions regarding shortwave QRP work in these terms: "*All of which shows that on 40 meters, there seems no reason why any one cannot be in communication with any one else without a lot of expensive apparatus. Witness the fact that with 9CCQ, a power input of 0.04 watt was successful in maintaining communication over a distance that represents a record of 26,500 miles per watt.*" His observations regarding propagation are enlightening: "*on 40 meters, reception is erratic, fading is bad, but phenomenal distances can be attained with low powers. On 80 meters, transmitting distances are not so great, but steady signals, good traffic handling, and the possibility of phone transmissions make it a very interesting band in which to work.*" Finally, it appears that the portable transmitter received considerable use by the *RB* staff with interesting results: "*This simple transmitter has been in operation at 2GY with complete success, reports indicating that the pure d.c. note penetrates*

much better than our 'high powered' outfit, for distances up to 1000 miles." The high power outfit undoubtedly was powered from the a.c. mains with the usual poorly-filtered 'raw a.c.' note.

2GY's Portable 80 Meter Receiver. *201-A's funtioned as detector and audio amplifier. Hammarlund variable capacitors served for frequency and regeneration controls.The coils were plug-ins for quick band changes.*



Station of Vere Davis, *9CCQ. The middle unit is the transmitter with three 201-A tubes in parallel; the receiver is to the right. Batteries are stacked behind big BC receiver. A stack of QST's is on the bottom shelf.*



As luck would have it, the record QRP contact was a two-way QRP QSO! *9CCQ* was using three 201-A tubes with 250 volts on the plates, with an input of slightly over 6 watts during the record contact and subsequent nightly tests. Henney's effort to recruit new amateurs from the ranks of BCL's perhaps underlies the inclusion in the article of *9CCQ*'s story. We learn that Vere Davis (*9CCQ*):

became interested in broadcast radio about three years ago and it's just a case of drifting from bad to worse, I guess. Have had an amateur's license now about four or five months and have been active about two and one-half

(months). I became interested in amateur radio just about the same as most anybody of my age and interests does. I've always read radio magazines when I got the chance and of course couldn't help seeing short wave circuits and the marvelous things they were supposed to do. I made my first successful short wave receiver last spring, a little less than a year ago, with the intention of listening to the short wave broadcasts and was very disappointed when KDKA came in strong but with bad fading and distortion.

So another fan, now 9CJD, and I began practicing the code, and to our surprise passed the amateur's examination. My first communication was with 9WQ at Elmhurst, ILL (40 meters), at about 4 o'clock p.m. November 1st. Next was 9BV at Council Bluffs, IA, and the third was 8CJM, Elyria, Ohio, but I found trouble raising stations. I could get a large current in the antenna but it wasn't effective. In a month or so I got time to improve the system and although I don't get the current I did, reports are better now. Have been reported at 5AQI, Meridian, MS, R6 at about noon. Plate voltage 220, mils., 33.

In what is perhaps the first "Operating News Report" such as were published in *The Milliwatt* and now in *CQ*'s 'QRP Column', we find the typical material including *9CCQ*'s first few contacts, problems with 'getting out', and finally, his solution to those problems and the improvement in successful QRP work.

II. Finally -- Windom (*8GZ*) Brings a Record Home

"...Windom decided that it was too easy to work the gang with so much power, so a UV-199 was placed in the transmitter..."

With the publication of the above article in the April issue of *RB,* the magazine turned its attention away from low power amateur radio, and in fact from amateur radio itself, perhaps in deference to *QST.* But during the same month, *QST* returned to QRP achievements in "Some Low Power Records", in which the astounding DX work by Larry Windom (*8GZ-8ZG*) was described. In the lead-article in the issue, Assistant Technical Editor John M. Clayton (*1DQ*) addressed a beginner audience in assuring them that a single-tube transmitter such as the one described in "Breaking Into Amateur Transmission" would be adequate. He noted that *"many amateurs have communicated over vast distances in the thousands of miles when using a single UV-199 receiving tube."* The implication of this comment, as well as many others scattered through the pages of *QST* during this period, is that the QRP grassroots movement was not limited to a few isolated fanatics, but indeed, was a general approach to hamming. Further, Clayton pointed out the need for a high degree of skill when operating with low power: *"Such work requires that the operator be an exceptionally good one."* But he continued on with the amusing statement: *"the location of the transmitter and aerial [must be] almost ideal, or the conditions under which transmission was affected so erratic that the set is not at all consistent."* What is amusing about the statement is that none of the low power work reported in *QST* reflected such location and antenna conditions, and furthermore, as *c9CK*'s work demonstrated and as Clayton reported it in the December, 1925, issue, reliability of low power DX *was* the main point of Foster's efforts.

In fact, it was Clayton's account of *c9CK*'s achievements that inspired *8GZ* to attempt the QRP feats which are described in this issue, as we learn from Clayton's opening comments: *"Windom of 8GZ-8ZG read the story of Colonel Foster's low power work, told in the January number of* QST *[actually the December, 1925, issue], and decided to go out and break a few of c9CK's records. He did -- and although we haven't the slightest desire to start a scrap and we do not want to spend the rest of our days trying to figure up 'miles per watt', we believe that he has set a few records that are hard to beat."* Indeed Windom did! But Clayton exhibited little appreciation for what *8GZ* actually accomplished. One gets the

impression that both Foster and Windom were viewed by Clayton as a pair of oddballs bent on impressing people rather than as serious amateurs dedicated to a scientific investigation of the possibilities of low power communications on the shortwave bands. In fairness to Clayton, however, it should be noted that he attempted to place *8GZ*'s work into perspective: "It is comparatively simple to set up a small laboratory oscillator and accomplish a miles per watt record from one room to the next that is hard to beat. Do it over four or five thousand miles, and it is a horse of a different color." In his typical dispassionate fashion, Clayton related the high points of *8GZ*'s accomplishment, rising to an entirely atypical level of excitement at the end:

> *8GZ-ZG started out on low power with a UV-201-A tube operating in the circuit shown in FIGURE 1. With 75 volts on the plate of the 201-A and 4 milliamperes plate current he had no trouble working bz1AB (Brazil), a5BG (Kauper in Austalia), o4Z (S. Africa), KFUH, oA6N, a2CG, z2XZ, and all the U.S. Districts. Next, a WD-12 was substituted for the 201-A and with an input of .15 watt (half of what was normally used with the 201-A) the set continued to work in fine style, 9AVJ, 9ADO, 8ALY, 2CTQ, 9DTK, 8PL, and others closer being communicated with easily. Windom decided that it was too easy to work the gang with so much power, so a UV-199 was placed in the transmitter. With the UV-199 the DX work continued. With 75 volts on the plate, and a plate current of 5 milliamperes a number of 'U' (U.S.) stations were worked and communication was carried on with a5BG, oA6N, and a2CG! Ohio to Australia and South Africa on a UV-199!!*

Remarkable indeed! We're dealing with QRP work of a most extraordinary magnitude, for DX work with 300-375 milliwatts input on 40 meters is of the utmost difficulty, even with modern antennas. At the time, the *R12 Smoothed Sunspot Number* stood at 61.

Windom's QRP Transmitter. *B Batteries, UV-199 and all components were mounted on a single board - 17,820 M.P.W.!*

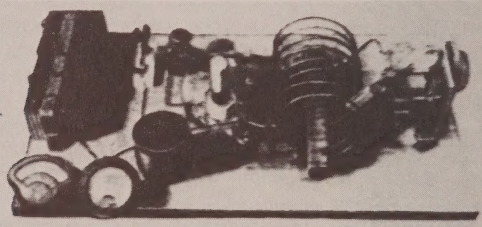
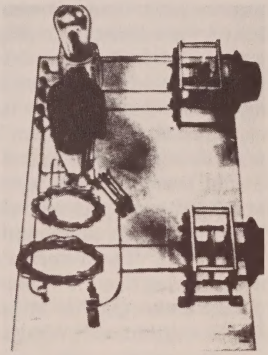


FIG. 2—THE TRANSMITTER, UV-199 IN PLACE

8GZ's transmitter was the typical Hartley oscillator built according to low-loss procedures, but with one puzzling feature: conductive coupling to the antenna. This configuration was out of date by the time *8GZ* did his work, and the ARRL expected the issuance of new regulations to outlaw it, even though the new regulations overlooked the problem until a little later. With regard to tube types, Windom found the UV-199 to be "the best low power tube, giving a much better signal with less input." Again, the superiority of the d.c. note produced by B battery power was stressed: "Every station who has worked 'low power' *8GZ* thinks the set crystal controlled." Undoubtedly, *8GZ*'s antenna contributed markedly to his phenomenal success with QRP. Clayton described it as a "Hertzian affair" supported by a pair of drainpipe masts 70ft high, one of which was insulated from

ground and used as a receiving antenna. The term "Hertzian" could refer to an end-fed half-wave, but terminology was not yet consistent at the time. C.F. Rockey, in "Those Who Have Gone Before" (*The Milliwatt*, June, 1970), suggested that *8GZ* used the antenna later named for him, the *'Windom'*, a half-wave horizontal antenna with a single feedline inserted about 14% off-center and tapped directly onto the oscillator coil. Whatever it was, it certainly worked! Unfortunately, Clayton did not include a list of *8GZ*'s DX contacts. The only further information about Windom's work would appear in the announcement of the winning entry in the Jewell Contest in the July issue.

The May, 1926, issue reminded *QST* readers about the Jewell Contest in this 'Stray': "*Hey. The low power fiends should not overlook the excellent Jewell Contest prize, a watch with lots of jewels. Some lad with a UV-199 is going to step in and become the proud possessor of a beautiful watch. Why doncha try, yourself, OM? If you have done any low power work at all, by all means get in touch with Jewell Instrument Co., 1650 Walnut St. Chicago. Did you get your copy of the contest rules they mailed to every U.S. and Canadian amateur? If you didn't, write Jewell and raise heck with them for leaving you off, but most of all here is something for nothing. Grab it!*" Not surprisingly, the official contest results in the July, 1926, issue indicated that *8GZ-8ZG* won the trophy- watch!



The announcement provided details about the three winning contacts by *8GZ*, which according to contest rules were averaged to produce the record miles per watt figure, and further, refers the reader to the April story about *8GZ* just reviewed above. With respect to the qualifying contacts, John H. Miller, Electrical Engineer of the Jewell Co., noted: "*The work was done with a 199 type of tube with four volts on the filament and from 70- 75 volts on the plate. The total filament and plate watts ran from 0.49 to 0.57 (watts).*" Note that *total* input to both plate and filament were used in the scoring and calculations. Bear this in mind in perusing Miller's summary of the winning contacts:

From 8:10 to 8:50 A.M. E.S.T. on December 30th, 1925, Mr. Windom was in communication with Australian 5BG, Mr. H.A. Kauper, 20 Gruney Road, Dulwich, Adelaide, South Australia. The distance figures 10,100 miles and the total input was .567 watts, giving a record of 17,820 miles per watt. Mr. Kauper acknowledged the transmission with a very detailed letter giving facts which confirm the transmission beyond a doubt.

At 12:30 A.M. E.S.T., January 3rd, 1926, communication was established with O-A6N, Major J.G. Swart, M.C., Cambridge House, Milnerton, Capetown, South Africa. The message was acknowledged by letter confirmation. Distance checks up 8,250 miles from Columbus, OH. The total input was .54 watts, giving a record of 15,280 miles per watt.

On February 28th, 1926, from 2:12 to 2:53 A.M. E.S.T., Mr. Windom worked Z-2XA, Mr. Geo. H. Shrimpton, 38 Rongotai Tce., Wellington, New Zealand. The distance figures 8,500 miles, and the wattage was only .493 due to a lower plate voltage, giving a record of 17,250 miles per watt. The transmission was acknowledged by Mr. Shrimpton.

Phenomenal results, even when using *total* input. If we apply the modern input concept of only plate input, the above figures would be higher. Based upon the April story, which lists the *a5BG, oA6N*, and *z2XA* contacts as occurring with a 201-A tube *at 300 milliwatts input to the plate, the records calculate respectively to 33,666, 27,500, and 28,333 miles per watt.* While none of these approach *a2CM*'s phenomenal 375,000 miles per watt on 240 meters, they represented the best American achievements to date. However, if one compares the official results with Clayton's April story, a discrepancy appears: the official report specifies a 199 as the tube used, while Clayton began with a 201-A, switched to the WD-12 and 199, and included the record contacts as having been accomplished with the 201-A. It would be fantastic to discover *8GZ*'s logs in some attic!

In addition to providing details about the winning contacts, Miller summarized Windom's other work, done with a 201-A at up to 2 watts input, with which stations as far away as Kansas City were worked. He observed with regard to this distance limit: "beyond which the ground wave evidently fades out and the reflected wave comes into play at the greater distances." As yet, the mechanics of propagation were not understood clearly. With respect to the un-sung heroes of *8GZ*'s story -- the receiving operators -- Miller commented: "It is rather interesting to note that the receiving sets used by the stations hearing *8GZ* were in no way unusual, most of them being an ordinary detector and one step audio. The transmission efficiency must not be credited to abnormal receiving equipment." Finally, the direct mail announcements apparently produced the desired results, for "there were quite a number of entries in the Jewell Contest, although most of them used 201-A tubes, and did not come anywhere near Mr. Windom's figures for distance." The historian's pained response to this tidbit of information would be something like: "*how many entries, what happened to them? Egads, a goldmine of data about QRP in the early days and it's been washed into oblivion by the tidewater of history!*" What a story the Jewell Contest entries could tell! Incidentally, readers possessing any information of QRP activity in the period, such as actual logs and the like, are invited to submit them for further historical use. Or to dream a moment, how about the 'billion to one' shot, the rediscovery of the Jewell Contest entries!

III. Of, By and For the Beginner

"...Glory be! My 'ammeter' lit! The variable leak eliminated the 'tweet'.
When the leak was properly adjusted,
my note began to 'toot', as it should, instead of 'tweeting'..."

And so, with the official announcement of the winner of the Jewell Contest, QRP passed out of the limelight in America for several years. However, in the previous month, one of those rare masterpieces appeared which captured the essence of the neophyte QRP'rs experience. J.T. McCormack, *9BHR*, struggled with the mysteries of radio in a manner Kruse undoubtedly approved of and we are forever indebted for his contribution. It might be helpful to provide a few explanatory comments on the terminology that *9BHR* used. First off, the transmitter that he described initially is a two-stage affair, with an oscillator and an amplifier. The second version is simply an oscillator type transmitter. The problem with frequency stability (*'swinging'*) occurred because the antenna was inductively coupled directly to the frequency determining inductance. In modern terms, the antenna was coupled directly to the v.f.o. inductance, and any slight change in impedance exhibited by the antenna "pulled" the frequency of the

transmitter. The power level of the unit was determined by the 201-A tubes: at a plate voltage of 96 volts they could be expected to operate at an input of about 2 watts. With 192 volts, the input probably would have risen to about 5 watts. The 'grid-leak' which *9BHR* unfortunately replaced with a C battery stabilized the grid-filament circuit by means of a very high resistance shunted by a large capacitor. The 'Bradleyohm' he resorted to was a commercial variable 'grid-leak'. The '*tweeting*' that he referred to as a tone problem is equivalent to our modern 'chirp'. The major method of tuning a transmitter in those days was by means of a thermocouple a.c. ammeter inserted in the antenna feedline; adjustment was aimed at maximum antenna current. The unit which *9BHR* initially built shows his rather ambitious, naive attitude. It was actually a receiver and transmitter built on the same 8 x 24 inch board with 6- inch front panel.

Of, By and For the Beginner

J. T. McCormick, 9BHR

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This article is meant for beginners and is written by a beginner. Old Timers who need a good laugh are welcome. Come on in! The writer (the beginner of the first part) has had poor luck in securing advice from old timers. They have *tried* hard enough, goodness knows! The difficulty lies in their not getting the beginner's point of view. Beginner's problems simply are not problems to the old timer -- and there you are! I recently began to 'get out' with my first little 'peep peep' station. I believe that an account of my experience in 'getting on the air' will prove rather helpful to the fellow who is just a jump or two behind me.

My first crystal set worked 'right off the bat' but my first transmitter has, er--taken some of the conceit out of me. Before receiving my license, I knew everything -- yes, everything! I had built a neat little outfit, transmitter and receiver combined, somewhat as it appears in the photographs, but not quite! Changes have been made.

Trouble Begins

The original transmitting hookup was a master-oscillator power amplifier ['*m.o.p.a.*'] affair, using a 96-volt storage B battery for power supply. 201-A tubes were used. I fondly hoped to neutralize this thing on forty meters! I suppose it could have been done by using enough shielding, time, and possibly, separate batteries for each tube. I did not have sufficient patience, however. Neutralization not being entirely necessary, it remained unneutralized.

My license finally arrived and I set out to 'knock 'em dead' with low power. I had no meters and so was using the usual flashlight bulb to indicate resonance in the antenna circuit. I had no difficulty in tuning the plate circuit of the power amplifier to resonance with the master oscillator. A flashlight bulb shunted across the antenna pick-up coil did the trick. When I tried to tune the antenna to resonance, however, I ran into difficulties. I did not have enough antenna circuit to light the bulb. I had forgotten the radiation resistance!

I finally conceived the idea of placing the bulb in the tuned plate circuit of the power amplifier. The bulb, by the way, should be inserted in the lead going from the variable condenser to the plate of the tube. If it is placed in the other condenser lead, the current is too great and it will burn out. When the antenna circuit was then tuned more or less to resonance the bulb went out. Simple! The bulb was then short-circuited by means of a switch provided for that purpose. Fine! I now knew, at least, that I was radiating *some* energy.

Next, I wanted to know what my station sounded like on the air. I tuned my receiver to forty meters. There was nothing but a 'swish' [*hiss*] to indicate that my transmitter was oscillating. I had expected this, however. The trans-

mitter oscillations being comparatively strong, the receiver was drawn into unison with the transmitter. I next tuned the receiver to twenty meters. Ye gads! The wave was afflicted with St. Vitus dance! I loosened the antenna coupling. Much better! I loosened it still more.

I next made a discovery. I listened on eighty meters and found that the wave seemed much steadier than when I listened on twenty. A little thought solved this mystery. For every change in frequency made by the transmitter its second harmonic goes through a change of frequency twice as great. When I listened on twenty meters I was listening to the second harmonic of my transmitter [*operating on 40 meters*] and things sounded twice as bad as they really were. When listening on eighty meters I was listening to the main wave of the transmitter *with* the second harmonic of my *receiver.*

All this sounds as if I had been holding the key down for hours. Not so. I believe that a fellow ought to have some sort of idea as to what he is trying to find out before he starts to test. If I do not hear what I want to hear within a minute or two, it is time to 'shut 'er off' and think it over again.

I next tried working the key. Another problem! My note had a terrible 'tweet'. By 'tweet' I mean that the wave 'skidded' very time I pressed the key, so that I heard only the dots and the beginning of the dashes or else heard only the tail end of the dashes -- depending upon how I tuned the receiver. I knew, in a general manner, the cause of this, but try as I might, I could not eliminate that 'tweet'. It seemed that the tube impedance began to change the instant the plate current started to flow and continued to change for a considerable fraction of a second. While the tube impedance was changing, the frequency was also changing. I did not try to 'work' anybody. No one could have read such a note -- though lots of folks never seem to think of that.

A Simpler Set

I suppose I should have 'stuck to my bush,' but I did not. I decided to work with something simpler and so discarded the whole master oscillator scheme. I chose the series-feed balanced Colpitts circuit popularized by Hoffman of the Burgess Laboratories and used in the set which was built for the Wilkins north-pole expedition. This hookup was simple and would use all three of the variable condensers which were already mounted in my outfit. I did not use a grid leak, however. I had been using a C-battery in the old hookup and continued to use it in the new one.

Grief and more grief! The same old 'tweet' persisted. Moreover, I now had no means of tuning my antenna to resonance. I decided to light up that antenna 'ammeter' or go broke. I went to the nearest radio store and spent thirty dollars for another 96-volt storage B battery and two dollars for a 'Bradleyohm' to serve as a grid leak.

Glory be! My 'ammeter' lit! The variable leak [*the 'Bradleyohm'*] eliminated the 'tweet'. When the leak was properly adjusted, my note began to 'toot', as it should, instead of 'tweeting'. If you do not understand what I am trying to say about 'tweeting' and 'tooting', listen to the crystal control stations -- they 'toot'.

I was now nearer than ever before to having a real station, but was still far from the goal. The wave was swinging much worse than had been the case when using the master-oscillator power amplifier arrangement. I loosened the coupling until it looked actually foolish. The swinging was improved by this, but not nearly enough. My next act was to give the neighboring BCL's a treat. I went out and guyed my aerial and counterpoise at short intervals with cotton string. (If you laugh, it shows that you don't know anything about 'forty meters', so there!) I tested again. Eureka! The wave was not entirely

steady, but was good enough to try. Now to work someone! Anyone! I was really not very confident of the result. An interval of two months or so had elapsed by this time since receiving my license. Little things -- such as continuous failure -- have a way of undermining a fellow's faith.

I spent the remainder of the afternoon and evening trying to 'raise' somebody. I called CQ (properly); I answered other fellows' CQ's but without response. It was finally time to go to work (I work at night) and failure was still mine. (No sleep that day, of course.) All night long, while at work, I pondered over the problem. I remember what the old-timers have told us so often -- that the amount of antenna current is no indication of how well we are getting out. I had noticed, while adjusting the set, that oscillation did not seem to be very strong at the high frequency end of the forty meter band. I had supposed this to be due to the peculiarities of the choke coil -- or some such thing. I now viewed the matter in a different light. "Perhaps", I thought, "oscillation is just as strong at this end of the band as at the other, but the antenna current is less because of *increased radiation resistance!*"

The following day I tuned the set as near to the short wave end of the forty meter band as I dared. It was necessary to couple the antenna coil closely in order to find resonance, afterward loosening the coupling until the wave was sufficiently steady.

Success at Last!

9CFN was on the air. I called him with as much outward confidence as if I was in the habit of working the antipodes daily, but I had an inward conviction that my signals were having a struggle to cross the county line. I threw the switch to the receiving side -- expecting nothing.

I want to tell you, fellows, that the sound of my own call letters zipping through my phones was the sweetest music I had ever heard in my life! I shall never forget it during the rest of my days. The music in Heaven will doubtless prove to be a distinct disappointment to me, provided, of course, that I--

Habit kept my pencil going, but my thoughts danced about in chaotic ecstasy. (I am getting poetic, but dang it! I have to express myself, don't I?) *9CFN* had finished and was waiting for my answer. I grasped the key. Something was wrong! It had turned into a 'bug' key! I sent a string of dots at about sixty per. Perhaps I was nervous. I tried using both hands. This only made it twice as bad. Horrors! I could not answer him! I wept and overturned my chair in excitement. My wife came running -- convinced that lightning had struck the shack at last! She found me leaning weakly against the wall, gasping for breath. I grinned an idiotic grin. "Gosh! Mom", I sputtered, "I *worked* a fellow!"

Sure, go ahead and laugh, but see what happens when *you work your first station.*

I was working too near to the edge of the forty meter band to be absolutely sure that I really was inside of it. Therefore, I went out and added a few feet of wire to my antenna for the purpose of increasing the radiation resistance in the middle of the band. I intend to stick right there -- in the middle of the band until I know my 'stuff' better.

After working a few stations, I made another discovery. I found, while testing for 'swinging', that a goodly portion of the unsteadiness was caused by my wife walking under the electric light fixtures. Experiment showed that the signal disappeared completely when the fixture was actually touched with the hand. This was true of any fixture in the house -- and I lived in an apartment house! I solved the difficulty by establishing a local 'ground' for the lighting circuit by grounding it through a condenser taken from a Ford Coil. This is as

good as an actual ground so far as radio frequencies are concerned and it will not blow your fuses if a plug happens to get turned around.

I worked more stations. By the time I had worked an '8', nearly a thousand miles distant, I was growing more and more proud of my outfit and more and more ashamed of my operating ability. Learning the code and the Q signals does not make an operator. My station has been 'off the air' for some time. At the present, I am just listening to the other fellows while I try to learn something about good operating-practice. Try to learn something about operating while you learn the code, fellows, it will save you time and embarassment."

In the effort to save other newcomers wasted time and effort, *9BHR* took pen in hand, and rightly deserves to be heard and remembered by all of hamdom *in aeternum.* May the Fates have favored him with many satisfying QSO's upon his return to the airwaves! Say 'Amen', QRP'rs!

IV. Exiled to Foreign Parts -- Buried in the Fine Print of the IARU Reports

"...digging some information out of the tables in the I.A.R.U. Department of back QST's to learn what wavelengths are used most by each foreign location..."

Even though QRP ceased to enjoy front-stage publicity in *QST,* its banishment to the fine-print IARU reports in the back of *QST* had perhaps even greater impact upon the elite DX operators of America. Like today's DX'ers who subscribe (at a high price) to various DX newsletters to keep abreast of what the foreign operators are doing and when and where they can be found on the bands, the American DX'ers of the 1920's undoubtedly poured over the IARU reports in search of the data which would place them on the right frequency at the right time to score another 'new one' for the DX list. They certainly could find such data, but a quite considerable portion of that data (about 40-50% in many of the DX reports) dealt with the phenomenal DX work by foreign QRP operators, and a sizeable portion of the non-QRP work was at the 'medium power' level of 30-70 watts, with only a few foreign operators using high power such as typified American DX operations.

The overall impression that the American operator would have gotten from the IARU reports is summarized in *z2XA*'s comment: *"Apparently high power is quite unnecessary for DX work."* In the remainder of this chapter, the IARU reports are excerpted to provide the modern reader with a 'window on the past'. And again, it must be borne in mind that, for the most part, these reports detail work done on the 80 and 40 meter bands, with scattered 20 meter achievements appearing toward the end of 1927. There is no need to provide a narrative framework for these excerpts since the early reader encountered them just as they are presented here: scattered bits and pieces of information. Imagine, then, that you have just begun working DX on 40 meters with a UV-210 at 70 watts input, and have been dreaming of a pair of UV-203's at 200 watts or a single UV-204 at 450 watts input for a further pursuit of DX work. You've just received the May, 1926, issue of *QST* and flipped immediately to the IARU report on page 54 -- that's where the dope is to be found...

British Section

"Conditions for DX work, as far as the British hams are concerned, have been very erratic during the past month. American signals come through for a few days at a time, and then completely fade out for a few days. The remarkable part is that when American conditions are bad, communications with South America and Porto Rico are always very good. Nothing extraordinary in the way of new DX records have been created by British stations. Several two-way communica-

tions with America with power of ten watts, and under, have been held. These include *g6YR, g5YK, g5SI, g5HS, g2DQ, g6BT,* and *g2XV*. Also Irish stations *gi6BT* and *gi1IB*. *g2LZ* has had a daily schedule with *pi1HR* (Phillipines). This contact has been very reliable in spite of the fact that communication with Americans in a westerly direction has been so erratic ... The best DX work by *g2LZ* was made on February 7th when during a space of six hours the following two-way contacts were made: *pi1HR, fi8QQ* (Saigon), *z2BX* (New Zealand), Egypt, *EGEC* (QTH??), *a3EF* (Australia), *oA6N* (New Zealand), *c2BG* (Canada), and *u1CAL* (U.S.)."

New Zealand

"By radio through *z5ZAI-9ZT* and *z2XA-z3AF-z1AO* we have the following account of New Zealand activities: "Apparently high power is quite unnecessary for DX work. *NFK* recently reported *z2XA* as R7 when he was using only 85 watts input in a new tube. *z2XA*'s normal input is around 250 watts into a Western Electric 50-watt tube. *z2XA* recently received sigs of *u8GZ* (Windom) when the latter was using a UV-199 with an input of less than six tenths of a watt ... Winter is now approaching and the DX already seems to be improving. Quite a lot of new low power ham stations are coming on the air and all are very anxious to be QSO the U.S. *z3AD* has worked England with an input of only 2.5 watts..*z2BX* has been working *gi* (Ireland), and *pi* (Philipines) stations with a 5-watt tube. Then he blew it!"

ANK

"A new spot on the globe has been reached by amateur radio. On March 11th, Decker, of *u1RD* (U.S.) was QSO *ANK* who gave his QRA as the Savoy Geographic Expedition in the Sahara Desert, 1000 miles south of Tunis. His wave was 44 meters, QSB R.A.C. and *u1RD* reported him R3 to R6 with a lot of fading. Apparently a portable set with a hand driven generator was used at *ANK*. A few minutes later *ANK* was QSO *u2GK* at Schenectady and later *8BPL, 2PP*, and was copied by *1BBK, 2AER, 8DSY* and *8ZAE* (all U.S.). We hope that we receive further particulars concerning this expedition."

The June, 1926, issue followed up on the May report on the progress of the Wilkins Expedition and its exploration of the Arctic regions. As usual, a forward party relied upon a battery-operated portable rig to maintain communications with the base camp, in this case located at Fairbanks. The advance party ground through a seven- week overland trip, met with grueling weather and related difficulties, and had to butcher several of the sled-dogs for food, but QRP measured up to the situation: "*During the party's seven- weeks mush, Waskey was in communication almost every night with Mason, back in Fairbanks, using the little battery-operated set which Mason had built, on a portable aerial. This set has two 201-A tubes, supplied by Burgess batteries. It is certainly wonderful the way those batteries lasted, particularly in the temperature of 35 below. The marvel is not that Waskey occasionally failed to get thru but that his set did so well over a length of time much greater than planned on.*"

Back in the IARU section, we get a glance at the outstanding DX work of a Hawaiian high school student: "*Another very excellent piece of DX work has been pulled off, hu6CLJ, Masayuki Misamoto, at Honolulu recently worked oA3B in Johannesburg, S.Af., using a 50-watt tube at an input of 39.5 watts on 38 meters. DX is 14,000 miles. This boy 6CLJ deserves a lot of watching. He is going to make DX hounds look to their laurels. With only 2.5 watts input to a 202 he has been QSO ch3IJ (Chile), about 6000 miles away and with either a 202 or 201-A he has been QSO several times with rDB2 (Argentina).*" Further, Irish "*6YW has worked the USA on 2 watts input, a record for Irish DX,*" and from the Phillipines we learn

that "Elser of *pi3AA* has just worked *g5HA* when the latter was using an input of only 5.4 watts."

A photo of *a5BG*, H.A. Kauper, who engaged in the historic tests with *c9CK*, appeared in the featured stations section of the July, 1926, issue. The unit employed a 201-A, and we read: "*This is an internationally known station, and is the product of H.A. Kauper, a5BG. A pair of transmitters are in use. The latest, and most interesting, is a low power affair using a 201-A with inputs ranging from 5.2-7.5 watts. On 34 meters this little set has been QSO the U.S. 14 times within the space of a few nights! He uses a 58ft antenna, 46ft high, with a 65ft counterpoise at* 10ft." The IARU reports in the July and August issues provide a few tidbits: "*Several low power stations are working in the Jersey Channel islands and have done good DX work with about 10 watts. These include g2ZC, g5CW, g6OX, and g6PU, all of whom have been QSO the U.S. g5SZ has done some low power tests with oA4Z (S. Africa) ... A number of French amateurs have changed their wavelengths from 43 to 33 meters with marked improvement in DX. On 33 meters, f8CP has been QSO a number of times with u's (U.S.), bz's (Braxil), a's (Australia) with only 14 watts input. f8YNB has been QSO u2AER (U.S.) when using an input of 2 watts.*" From Chile: "We have 12 stations on the air in the 43-37 meter band. All are using either 5-watters, or receiving tubes operated from the d.c. city lighting mains." *I5B* (Italy) was reported as having worked a number of British stations while using an input of 3 watts.

The October, 1926, issue provided the type of special information that would whet the appetite of any DX'er in regard to rare Java: "*3-4 hams are operating in Java. The illegal PK7 has increased his power to 10 watts and has been QSO the U.S. every night afterwards. He uses two Phillips 201-A tubes for transmission. PK1 is now on the air in the 40 meter band with a 5-10 watt input.*" No doubt hordes of American DX hounds scanned 40 meters daily after reading that! Another expedition, the Putnam Arctic Expedition, was noted as having relied upon QRP. Ed Manley, operator of the expedition station *VOQ*, even passed traffic to the states via *u9CP* (U.S.), and reported that "*contact next to perfect even when VOQ using the low-powered emergency outfit.*"

A complete rundown on Irish operations appeared in the IARU section, where the distinction was drawn between Northern Ireland ('*gi*' prefix) and the Irish Free State ('*gw*' prefix). The report continued: "*gw5NJ continues to QSO Australia, New Zealand, and South Africa, and lately has worked Argentina. Phone sigs have been put across to Australia, Canada, and Brazil. gi6MU is at present on a voyage from Ireland to Canada and back, and contact was maintained easily all the way across the Atlantic each night with 5NJ and 6YW. 6YW uses an input of 6 watts and is one of the best low power G's. He holds a record by raising and working Porto Rico on 2 watts, and on this power he has been QSO U.S. and Canada regularly. This is hard to beat. In Southern Ireland (Irish Free State), no station at present uses more than 10 watts input but excellent work has been done. I1B* and *I8B* have both worked the U.S. more than once and *I9B* has worked all Europe on 3 to 5 watts. Other excellent low power work has also been done, there is not space enough to give details."

The November and December, 1926, issues provided a good survey of several areas. With respect to operation in Japan, we learn that the newly formed JARL had about 30 members, mostly high school students, who operated illegally, since amateur radio was not yet permitted there. "*The majority use either 201-A's or 202's. Despite the low power, the 'J's' are QSO China, the Phillipines, and the U.S. almost every night.*" South Africa reported: "*o-A3E on low power in Natal, has been doing excellent work with the 'u'(U.S.) stations. He has been QSO the 6th and 7th districts with daylight all the way across ... S. Africa is a vast country like the U.S. and the large towns are separated by distances of hundreds of miles. A great*

deal of work is being done by some of the hams on low power, using receiving tubes with inputs of 2-8 watts. Pretty regular communication is being establishd over distances of from 800-1000 miles." From Madiera: "*P-3CO has been working with an input of 15-20 watts and has been QSO the following U.S. districts: 1, 2, 3, 4, and 8, and has been heard by 5th and 9th district stations, one of the latter being in Colorado and Mexico, and has worked Brazil.*"

The University of Michigan Greenland Expedition, signing *dg1XL*, was reported as having worked *VOQ* at 1000 miles. The expedition used a pair of CX-301-A's [*similar to the UV-201-A*] in a Hartley circuit, B batteries supplying 200 volts for the plates. Operation on 38-41 meters from a puptent relied upon a 40ft wire and a fan counterpoise with three 20ft wires.

Australian *z2YI* reported that "Chinese *ICRS*, a 5- watter in Shanghai, is heard often." From Chile: "*ch4AQ at Chance, using one 201-A tube with 220 volts of d.c. on its plate has been working many U.S. stations and established the first two-way work between Chile and Porto Rico when he QSO'd pr4SA (Puerto Rico). ch4AQ has also worked z2AC, z1AX (N. Zealand), and has been heard in* England." From Denmark: "*There are now about 35 licensed transmitting stations in Denmark, including one in the Faroe Islands (d7JO). Most of these stations use from 5 to 10 watts of power. d7MT has been QSO the U.S. with only 5 watts and has also worked Brazil.*" From Japan: "*j3AA for 5 months has been using a single 5-watter and has worked z's (N. Zealand), Uruguay, 6th-7th U.S., Australia, S. Africa, Hawaii, and the Straits Settlement.*" From France: "*The station of f8GM has managed to QSO New Zealand when using very low power. 8GM's sigs were reported R5 by six New Zealand operators. He is using the symmetrical system type circuit known in France as the Mesny circuit, with 4 receiving tubes having a total input of about 4 watts. Jamas of filB in Saigon, who is now on the air with a power of a few watts only, has nevertheless been heard by f8KF. This is certainly a fine low power record.*"

V. 1927: And Then 20 Meters

R12 S.S. Numbers: 72-69

"...and find solid contact possible with very low power..."

1927 saw an increasing movement down to 20 meters, so much so that *QST* carried the "20 Meter Report" every month which provided details of amateur discoveries about that band. Foreign operators apparently were there first, and the announcement of the first international DX contest in March, 1927, '*An International Relay Party*' drew attention to their presence: "*Any wavelengths at all that are used by amateurs may be used in the contest. It may be helpful if the participants spend some time in advance of the tests in listening-in to note where everyone is located on the dial or even in digging some information out of the tables in the IARU Department of back* QST*'s to learn what wavelengths are used most by each foreign locality. 20-meters will undoubtedly play an interesting part in this contest, as many countries are working on that wave already and find solid contact possible with very low power. The man with the one or two five-watters has just as good a chance of rolling up a big score as the chap with the high-power outfit.*" Again, foreign DX accomplishments were linked with QRP. A note from *sc3AG* (Chile) in the August, 1927, "20-Meter Work" report verified the wisdom of the contest announcement: "Undoubtedly, the 20-meter band is better by far than the 40-meter band for U.S. contact. Only twenty of my 232 points in the International Relay Contest were obtained on 40-meters."

The IARU report for January, 1927, called attention to the usefulness of 20 meters for DX work: "*It is hoped that much effort will be put into 20-meter operation soon ... A nice low-power stunt was recently pulled off when Grindle of Hammond, Indiana, put over a string of signals to G.W. Mitchell of London. Grindle was using a single 201-A tube operating on 21.3 meters, with an input of 0.78 watt.*"

The foreign operators continued to run moderate power for their DX work with excellent success. Maurice Island was noted as having recently appeared: "On November 4th (1926) Strout of *u2NZ* (U.S.) speared a new station in a new 'country' when he worked *w-3XB*, A.W. King, 33 Virginia Ave., St. Paul, Maurice Island. *g2BSL* intercepted both sides of the QSO and subsequently *u1RF, u8ALY* and *u4NH* were in communication with *w- 3XB. u2NZ* reported his signals as R4, a.c. note and his wavelength around 33 meters. *w-3XB* was using an input of 60 watts at the time of his *2NZ* QSO. Maurice Island is near Madagascar."

The S. Africans were quite active DX'ers, as we find frequent IARU reports from them, as in the February, 1927, issue: "*Conditions have improved a good deal and many QSO's have been made between nu's (U.S.) and fo's (N. Zealand). The 6th and 7th (U.S.) districts get a lot of attention in the afternoons here, the signals apparently coming from the East -- the longest way around. foA5Z and foA3C are to be commended highly for having established communication with the nu's (U.S.) as they use very small power. foA5Z uses an input between 20 and 30 watts and has a pure d.c. note which is due to storage battery plate supply. South American stations are now booming in again and many QSO's are being made. Some of the best sb (Brazil) stations are 1BI, 2AB, 1AO and 1AW. These four can be heard nearly every night and in addition a great number of the low-power Brazilian stations are being heard and worked here now.*"

The February, 1927, issue carried a significant announcement: "**QRP-QSO Tests for 20-Meters.** *The T. & R. Section of the Radio Society of Great Britain announces further tests to be held daily during the month of February. Efforts to establish two-way communication with as many stations as possible will be concentrated on Saturdays and Sundays particularly, when most station-owners can spend all their time operating the set. The eg's (England) will operate on 23 meters (13,000KC's) using a maximum power not exceeding 25 watts which preliminary tests indicate is ample ... The T. & R. Section is endeavoring to make the test an international one.*" Apparently the low-power emphasis was widespread enough in England to warrant the formation of a QRP club by 1927. The March, 1927, issue informs us: "**The Q.R.P. Transmitters Society** *with headquarters at 178 Evering Road, Clapton, London, E.5, England are desirous of arranging a schedule for working across the pond on about three or four watts and would be glad to hear from any 'nu's' (U.S.) who are interested.*" Unfortunately, no follow-up report appeared with results. Nonetheless, The *G-QRP Club* can find great pride in being the latest generation of the first QRP Club ever founded!

The April, 1927, IARU report from New Zealand suggests that 80 meters had experienced something of a demise with respect to DX activity: "It is hoped that some of the U.S. stations will return to 80 meters and be QSO 'oz' (N. Zealand) again. It's a long time since one did! Several of the boys are taking portable sets with them on their travels and hope to be QSO the world on 199s and 201- As. Among these are *1AA, 1AE, 1FO, 2GA,* and *4AO.* They would appreciate reports." Seems that QRP operators never change, always hoping for the improbable! South Africa once again reported QRP DX work: "*It is the middle of the summer here and very hot. Conditions are still very good for DX work and good performances are being put up by some of our low-powered men. foA3T has worked Australia with ten watts; foA3T has worked Malaya with five watts and many like performances are taking place.*"

Likewise, Irish amateurs were doing excellent work with QRP: "*The Northern Ireland stations continue to do splendid work and it is satisfactory to record that the recent low-power tests, under the auspices of the RSGB, were won by eg6YW. The previous low- power work of 6YW is well known and it is, therefore, not surprising that he was the best station in the British Isles during the tests. On five watts, contact was had with the whole of Europe, also many U.S.A. and Canadian stations.*

eg6MU, another well known station, secured third place in the tests, being QSO many U.S.A. and Canadian stations as well as being heard in India and many other distant places with an output of five watts. Two other stations, eg5MO and eg5WD, also worked the U.S. on 5 watts or less, so that, when it is remembered that there were only about a dozen stations in Northern Ireland taking part in the tests, these results are very satisfactory." Indeed they were! It appeared that, judging from this unofficial 'results' report, QRP activity was impressive in the **QRP-QSO Tests for 20 Meters** sponsored by the RSGB. In addition, the work of some moderate power Irish stations was noted: "*eg6MU,* on between 50 and 75 watts input, is doing splendid work, having recently worked Indo-China, Australia, New Zealand, India (*on two and a half watts input on one occasion*), Mosul and other places. It is expected the station will be on crystal control by the time these notes are in print. Excellent DX has been done by *eg6SQ on about one half watt input* and other active low-power stations are *2BB, 6HI, 5GH and 6QD. 5NJ,* on an input of 75 watts, has had most consistent DX results during the last few months. Countries worked include China and Borneo (for the first time from Ireland), also Australia, Tasmania, S. Africa (all parts), New Zealand and sundry South American stations including Uruguay, Argentina and Brazil ... In the Free State, things seem quiet, and few stations report doing DX. *eo1IB is, however, making up for the silence of the others, as he has been QSO a large number of U.S. stations lately on 7 watts input. On this power he is usually able to get 'across the pond' any evening, being R5 to 6 in the U.S.A. His DX is most consistent and good. eo14C has put up a record by working the Straits Settlement on 10 watts, this also being the first two-way contact between Ireland and that country. He is also doing excellent DX work with U.S.A.*"

Periodically, QRP operators would submit reports to the "20- Meter Reports" section of *QST* detailing their successes on that band. In the June, 1927, issue, for example, *7BB* "reported traffic plentiful and he has been QSO all districts with 6 watts input in less than three weeks." *nu5ACL* reported a plethora of ZL stations and had worked a few: "He has been QSO *oz2AC* and *ef8CT* (France) and worked a ship signing *deTC* on 20.5 meters 1400 miles from the U.S. with one 201-A and 110 v.d.c. from the ships supply. This station was unlicensed but will have license soon." *nu4PX* noted: "*20 is sure FB but you have not yet sung its praises loud enough from the standpoint of the fellow with low power or poor location -- or both. I have a 7 1/2 watter and a back yard full of high power lines -- no chance for an outside antenna. My antenna and c.p. (counterpoise) are each made of 15 feet of stranded electrical light wire. The horizontal parts are about 11 feet each with ant. and c.p. separated about 7 1/2 feet and in same room with transmitter. In three weeks on '20' I have worked all U.S. and Canadian districts with reported of R6 to R8 from France and Australia and what's better, perfect contacts thruout long QSOs.*" The Editor noted of *nu4PX*'s report: "This letter speaks for itself."

The July issue carried a brief note on the state of affairs in Japan: "The Japanese amateur has not been having a particularly good time although he certainly has been active, in a way." Authorities attempted to track down Japanese amateurs in the act of carrying on illegal transmissions, but word got around, and no one operated. But the editor of a BCL magazine tricked one of the unsuspecting operators into providing a list of all active operators, which he then turned over to the police. Before the shut- down of activities, "*There were more than 40 enthusiastic amateurs and although they were using very low power most of them were making remarkable records. The average station consisted of one or two 201-A tubes while a few were using 202s. A very few 'high power' stations employing 50 watters were in operation. Despite this low power most of the stations were in contact with New Zealand, Australia, South America, China, Philippines, and Africa.*"

Clandestine operations continued, and readers were given the not- infrequent advice that all QSL cards should be sent "under cover" to avoid tipping off the authorities.

In the Correspondence section of the same issue (July, 1927), T.P. Allen of *eg6YW/eg2BX,* North Belfast, Northern Ireland, submitted an impassioned plea to the high power American operators:

QRP

"Editor, QST: Although I hesitate as a QRP man, to put my views forward in your columns, I do want to support the pleas of eg6YQ and eg5MQ in your April number and to add a few extra remarks on my account. These remarks do not solely apply to 'nu' (U.S.) stations and I hope other stations will consider them. Many 'nu' stations and others give a 'CQ Europe' call and after listening for about thirty seconds give another CQ call. It is obvious that they only wish to work high-power stations and do not carefully sift the foreign band. I find that to go carefully thru the 40-meter 'nu' band, takes at least six minutes and I think the offending stations might search a little more carefully.

Please remember, the majority of our stations are limited to ten watts input and only a very few are on 32 meters. I know of several DX stations that only listen for British stations on 32 meters and thus, after a CQ call, leave many of us calling them uselessly on 45 meters ... There is no doubt that our QRP signals often get thru to 'nu' stations with fair strength. This was obvious in the recent QRP tests when no QRO stations in Britain were transmitting and I was able to work four 'nu' stations and one 'nc' (Canada) in an all-night sitting with five watts input, receiving average report of R-4. On ordinary nights, one gets the impression that DX stations will not reply to a rather weak signal but call and call again til they get a QSA reply.

At the same time, I wish to thank those stations who have carefully sifted the 45-meter band and given many of us QRP stations the pleasure of a QSO; I wish there were more of you! More power to your excellent journal -- it's great!"

Allen's ironic "more power" leaves little doubt as to his real judgment of the American high power operators -- he, Kruse and Maclurcan could have had an excellent ragchew on the subject! The American reliance upon brute force again was directly linked to deplorably poor operating skills.

The September issue, provided mostly general information in the IARU section, with a few tidbits involving QRP: "In Austria, there are now over one-hundred active amateurs (all non-licensed; please send all cards under cover!) mostly working QRP although several are using powers up to 400 watts and are working regular schedules with Australia, U.S.A. etcetera." The Italian A.R.I. reported that "*i1AU has been doing some very find work with an input of only 3 watts. i1NO has worked New Zealand and all continents on phone with 15 watts* input."

A letter from D.L. Edmundson (*5ARA*) appeared in the Correspondence section of the October, 1927, issue and reminds one of those beginner's days that many of us have experienced in our own QRP pursuits. In fact, it could be titled "The 5ARA Story" and put at the beginning of a book about QRP! The scene is Louann, Arkansas:

An Accidental Convert

"I am a member of that ever increasing order of converted BLCs, most of whom have been led over by QST. I have gone through the usual stages of 'one tube and up' sets and, located as I am where the only interest in radio of any kind is listening, I have trod a rocky path. To get information on my pet subject, I was forced to buy every radio publication that newstands offered and purchased a copy of QST one time mistaking it for a BCL magazine. After discovering my error I decided that it should be read rather than let the two-bits be a total loss and the further I got be-

tween the covers, the more interested I became. My previous idea of amateur radio transmitters was that they were something that rich men's sons and single men with sizable incomes could play with. Imagine my surprise and subsequent gratification when I discovered that a small workable outfit could be put up for the cost of a fair broadcast set and that, with the junk on hand and very few purchases, I had one at my command.

I soon discovered the joker, however, in the ten words per minute. Work on the receiver was under way, though, and after its completion followed many hours of listening and copying the various ham and commercial stations and the old key and buzzer had its workout. I seined the whole countryside for someone in whom enough interest could be fired to hold key and buzzer sessions with me, all without avail. When I reached the stage where some of the commercial stations could be copied solid, Uncle Sam was approached in the matter of a license which was promptly granted.

In the meantime, the balance of the BC set had gone into a tuned plate, tuned grid transmitter using a couple of 201-A's. Then came the matter of power supply. The only available current supply was 110 volts, d.c., generated locally with a large gas engine as the motive power which ran unsteadily and generated a brand of power out of the question. The one silver lining came in the fact that the current came free of charge and was ideal for charging storage batteries and 180 volts of storage plate power it was.

Don't imagine that I went on the air immediately and gathered in a lot of DX. I listened and answered CQs and sent them in great flocks without result. The weather was almost unbearably hot and the neighborhood electric fans on this d.c. supply put out a brand of QRM that could not be beat ... After the receiver had been rebuilt twice and the transmitter had been reborn three times, the thrill of a lifetime came when a '6' answered a CQ and came back with 'R5 dc fb om.' This, on twenty meters with a plate current of twenty-two mils and an antenna current of .025 amps as near as it could be read on a .5 amp meter. Since that time, all U.S. districts have been worked on twenty meters with R5s from California to Massachusetts. At noon, Mass. gave me R3. My antenna current will not light a 1.5-volt lamp and the cover had to be removed from a Spark C and the glass grasped right over the live end to get an indication from the stator plates of the plate coil tuning condenser.

Sitting down here working without help, I learn lots of things and hear lots of things. Some things I hear are good and make for the advancement of amateur radio and some things are not so good. The fellows working on the twenty-meter band are one fine bunch of boys and I would like to have some means of thanking those of them who have been so patient with a new ham just starting out and whose sending must be atrocious. I will welcome any suggestions from those boys; in fact, I invite them...."

D.L. Edmondson's (*5ARA*) closing paragraph should provide encouragement to beginners who are stuck out in the middle of nowhere with no radio amateurs in sight to help them along. It has been that way for many of us throughout the radio era. Perseverance brings that desired reward -- contact with others like ourselves via radio.

Colonel Foster (*nu6HM*) of *c9CK-a5BG* fame reappeared front-stage center in the IARU report of the October, 1927 issue with a summary of some QRP experiments:

"While nu6ZAT was visiting nu6HM, they dug out the little TG & P transmitter using a single 201-A tube and on 20.2 meters worked eg5HS (England). This set is the same one that Col. Foster had used in Canada during the previous summer. Contact was established for over twenty minutes when eg5HS had to quit on account of a sked. This was on June 6th and on the 10th, both ac8HB (China) and fo1SR (N. Zealand) were worked with the outfit. This completed a very interesting

record for the set which has now worked stations in all continents with an input under 10 watts. We imagine this to be a record that very, very few will ever duplicate unless radio conditions improve considerably.

There is one station that has very nearly matched this in the shape of oa2SH operated by Alfred Short in Lambton, N.S.W. (Australia). The following is quoted from a letter of his to nu6HM:

'Whenever I hear your call on the air, I always remember reading about your first QSO with Australia using a 201-A tube as a transmitting tube. I marvelled at the time that such a small tube should be capable of sending a signal such a tremendous distance and I still marvel when I receive a reply from distant stations telling me that my signals are 'R6 FB' and are the best heard from Australia that morning. It is truly remarkable that such a small tube should cause a bigger commotion in the ether in distant countries than some of its bigger brothers with, at a conservative estimate, forty times the input power!

'Since last writing you, I have been QSO ei1NO (Italy) with an input of about ten watts into the 201-A and was reported R3. A few days earlier, I was reported R3 by 3SR in Rhodesia with about the same input. During the same week, with an input of around six watts, Canadian 5AJ reported me as 'R6 vy FB.' Having previously worked Japan and French Indo-China in Asia, I need only to work South America to have been QSO all continents with the 201-A. South America is a very difficult continent for us to work as we hear their stations only occasionally. However, you may be sure I am on the look-out for an opportunity to work one of these stations and once more re-win my WAC certificate'."

The IARU editor went on to comment: "*It is interesting to know that although oa2SH first won his WAC membership using a 'fifty-watter', he was not satisfied until he had duplicated this using a 'fiver'. Now he has come mighty close to doing the job over again with a 201-A. This is certainly a fine example of what makes amateur radio what it is today. Our congratulations to both these stations who don't stop trying as soon as they obtain their certificates but put in front of themselves seemingly insurmountable obstacles and then, jump over them. That's the real amateur spirit!*" Amen, brother! So many have followed the same path as *nu6HM* and *oa2SH* -- working DXCC with the KW, then discovering the real challenge of doing it all over again with QRP power levels. As long as this keeps happening, there is hope for amateur radio!

The November and December, 1927, issues round out our survey with a few QRP items. From China: "*Dr. Malcolm, Health Officer at Chefoo, N. China, has had a short-wave receiver for some months which had been built for him by our star performer, Edouard Foucret of Shanghai. He had no transmitter and to amuse himself and get some key practise, he inserted a key in the 45-volt plate supply lead to the detector tube (201-A) and had some fun in working at anchor in Chefoo harbor. On the evening of June 18th (1927), he sent out a CQ and immediately got a reply from xep1MA which he believed to be some boat entering Chefoo. Imagine his excitement when it turned out to be the Portuguese cruiser, 'Adamastor' then at anchor at Macau about 1200 miles distant.*"

And finally, we get a glimpse of activities in Czechoslovakia in the December issue: "*There have been no changes made in the legal aspect of amateur radio and the amateurs are working under cover on 45, 32, and 20 meters. OK1 who formerly used high power and made contacts with stations all over the world, is now using a low- powered transmitter with an input of ten watts. He has a portable station also and uses a mast that may be folded up when not in use. AA2 did some very nice work during the summer with a portable set having an input of from two to ten watts. 1AB is located in the center of the city of Prague and uses an indoor aerial. With an input of about 20 watts, he has worked Nijni, Novorod, U.S.S.R., a distance of over 2200 kilometers. 1KX and 1RV who use 220 volts a.c. have had some*

fine results on the 20-meter wave with from one to seven watts input. 2UN and 2YD who also work on this band have been using powers up to sixty watts. The best DX of 3SK has been about 2500 kms., a very nice piece of work when it is considered that his power is only about one-tenth of a watt ..." And with this phenomenal piece of QRP DX work we come to the end of our survey of QRP activity in the 1920's. It is fair to say that the major impression conveyed in the IARU reports was that DX operators were primarily QRP operators who spanned great distances using minute amounts of power. In fact, the reports in 1927 rarely mentioned exploits performed by the QRO foreign operators -- space not given to QRP exploits was generally devoted to news of a practical nature with regard to activities in DX countries.

The emphasis upon QRP by Kruse and the *QST* staff began in response to the fabulous QRP exploits of foreign operators, and after Kruse's fulminations echoed into the past, the foreign operators continued to post their records, to ply their skillful difficult trade, to demonstrate to the world that QRP could do it. Sadly, it was a lesson that was lost on American amateurs who moved to higher and higher power levels despite the fact that high power was unnecessary. Perhaps the movement in that direction occurred simply as a consequence of the stereotypical American attitude that 'bigger is better'. It is the attitude that created the gas-guzzling monsters of the highways, that has raped our good earth to the point where our survival is threatened. All along the way, there have been high-principled individuals who have spoken out against the American lust for power and magnitude in all forms, and amateur radio has been gifted with such individuals. And they spoke out loudly during the 1930's, led by individuals such as Schnell, Handy, Battey and others.

Chapter 6
1930-1941
Grassroots vs. High Power QRM

"...It is really about time that the 'forgotten man'
with his little two watter is given a break.
Lord knows, he has ... poured forth enough effort to merit it!..."

The 1930's saw a marked advance in amateur radio on all fronts. By the middle of the decade, vacuum tube technology was already in its modern state, giving the amateur greater dependability, tighter quality control tolerances, higher efficiency, and higher power capability at more economical prices with tubes such as the 6L6. Knowledge of propagation theory had moved down to 20 meters, although the 10 meter band was still an unknown quantity in the early part of the decade (15 meters would not be allocated for another 20 years) and became a focus of a pioneering effort along with 56 MHz. Antenna theory was in a state permitting creative application of principles to gain antennas including wire arrays such as the *8JK,* and collinear and broadside wire arrays, as well as crude rotary yagis. And coax was a culprit far in the future as open-line feeders ruled the space between earth and skywire.

The advances in vacuum tube technology was both a boon and a detriment in regard to the ideals embodies in Kruse's *New American Amateur.* New tubes permitted ever greater efficiency, but they also invited a greater abuse of high power. The staff at *QST* seems to have undermined itself in regard to these ideals. On the one hand, *QST* encouraged low power work and the ideals associated with it, and lauded QRP achievements until about 1938. *QST* even sponsored a low power contest once (August, 1937). On the other, the 'model' amateur station photos featured, along with lengthy descriptions, in the 'Amateur Radio Stations' section of the *QST* of the decade, unfortunately implied that a 'good' station is a 'big' station with multi-shelf transmitters capable of running hundreds of watts and more. In very rare instances (two or three during the decade), an average unimpressive station in the 40 to 50 watt range slipped into the section, and a genuine QRP station was featured but once. The impression created by these photos was probably the same as in recent times, and gave no inkling of what the grassroots station was like. As we'll see below in reviewing the statistics included with the 'Results' of the annual 'Sweepstakes Contest', the majority of grassroots operators (or should we say 'the majority of contesters') used simple, relatively low power transmitters, and some even used real QRP inputs. This fact was emphasized in the 'Results' reports.

Perhaps the most significant aspect of the progress of amateur radio in the 1930's is that the low power grassroots was not a 'silent majority', but rather vociferous in its complaints about the abuse of high power, and in its repeated reminders of the ideals associated with the *New American Amateur* in the 'Correspondence' section of *QST.* 'Letters to the Editor' across the decade reiterated the basic contentions that low power requires skill, knowledge and efficiency on the part of the operator while diminishing the QRM problem. Resentment at the QRM caused by high power stations apparently was widespread and found expression in the re-use of Kruse's derogatory epithets such as 'watt-burner' and 'ether buster' from time to time.

From our perspective, it is difficult to grasp the mindset of amateurs of the 1930's. Many had lived through the early pioneering efforts of the 1920's and learned their ideas about hamming from Kruse and Hatry. Many newcomers had scrounged through early *QST*'s with similar results. The great achievements of the early QRP'rs were not so far in the past as not to be a part of the current amateur scene; for example, the twentieth anniversary issue of *QST* (May, 1934) in very briefly summarising the high points, included the *a2CM* as well as the New Zealand - Agentina DX records along with only three other specific 'on the air' achievements in amateur radio. The low power operator of the 1930's probably felt a direct and immediate connection to all that Kruse embodied in the *New American Amateur* and the right to fight for those ideals. So, when *W1EXC* introduced the "**Flea Power Association**" in 'Correspondence' in the February, 1937, issue of *QST,* he brought forth such a enthusiastic response that Editor Kenneth B. Warner (W1EH), after filling over a page of the May issue with excerpts, had to cut it short with the note "*Representative of a large amount of mail expressing opinions on this subject are the above letters. Other excerpts next month".* At no other time during the decade did Warner receive such a deluge of mail on a subject that he had to take a similar step. This fact leaves little doubt about the demographics of American amateur radio (45,000 licensees in 1934) in the 1930's: the vast majority were low power operators using single Type '10 tubes at 30 watts input and under. Many still were using UV-199's and 201-A!

The first, and most eloquent, of the series of 'Letters to the Editor' espousing lower power appeared at the beginning of the decade and was written by an early 'giant' of amateur radio, Frederick H. Schnell (*W9UZ*). At the time, Schnell was Traffic Manager and Technical Director of the ARRL. In the early days, he was one of the major pioneers of the shortwaves. He had been selected by the Navy to conduct shortwave experiments aboard the *U.S.S. Seattle* during the summer of 1925 and ultimately demonstrated the superiority of the shortwaves for naval communications to the Navy. He undoubtedly knew Kruse and Hatry and shared their ideals, and had been severely disappointed at the direction taken by amateur radio in the intervening years. The early vision had miscarried, so much so that he took pen in hand and unburdened his heart in what remains to this day a masterpiece of amateur radio literature that must be read unedited as he wrote it. The Old Man is the fictional audience for Schnell's appeal to the early vision.

A High Power Holiday?

Mr. Editor, I would very much like to sit down with the Old Man, the Grand Old Man of amateur radio, and unburden myself of some thoughts, make 'heart to heart' confession as it were. I cannot afford to galavant all over the country, tagging around after him, because Heaven and you alone know where he is and neither of you will tell. About the time I thought I was close on his heels in one district, he probably would be over in another. So about the best I can do is to write out my yarn and you can pass it along to him to see what he thinks of the idea, a three year 'High Power Holiday.' Well, here goes, and I hope the Old Man is comfortably seated, the pipe properly filled with plenty of tobacco and hitting on all eight, the cat peacefully sleeping and the static nil.

Ever since I first heard the magic word 'wireless' there was enough mystery in it to fascinate me. I investigated it year after year and have been investigating it ever since only to find that we call it 'radio' instead of wireless. The investigation has been a mighty expensive experience but it also has been quite a productive source of real enjoyment throughout these years, with a thrill here and another there. Of course, it all goes back to those days when

radio was 'in its infancy' and a spark transmitter was a nuisance, and we knew it but wouldn't admit it. Why, if any amateur would dare to use a spark transmitter today, he would bring upon himself the wrath of the whole country. Such a transmitter would blanket two of our amateur bands and wash out all the commercial and government stations in between and on both sides for quite a few kilocycles. You know, those old spark transmitters never used less than 250 watts according to the transformer rating, but no honest Old Timer will deny that a good many of them were pulling 15 to 20 amperes from the 110 volt house line. And the funny part of it was that only a few of them were able to do any real DX like we do with our c.w. tube transmitters. Five hundred miles was good DX, 800 miles was very good, and when someone clicked off 1000 or 1200 miles, that was something to write ARRL headquarters about.

And that is what brings me to my feet and that's what makes me think we are burning a lot of power -- in fact, wasting it unnecessarily. Not only that, but we actually boast and brag about the amount of power we use, when we ought to be ashamed of ourselves for even mentioning it. Oh, yes, I'm right in the same boat. I've had what might be considered high power gear ever since two-kilowatt transformers have been rated at one-kilowatt, and I've been operating a c.w. transmitter that uses two 250 watt tubes. I'm not throwing bricks at anybody -- I'm thinking of my own misguided efforts too.

We talk up the fact that we United States amateurs have the cream of it all. We are allowed to use one kilowatt of power input (if we can afford it) when amateurs in some other countries are allowed only 10 watts. We are permitted to use any part or all of the amateur frequency assignments while amateurs in other countries get but small slices of one amateur band. Yes, and there are some who even kick about this, and they even get up petitions about it. Why, we used to shudder at the thought of what would happen to us if we had been restricted like the Canadian amateurs were back in those old days! They could use one kilowatt of power on 50 meters. A very generous allocation it would be today, but in those old days it was enough to crush the spirit of any but the most persistent amateur.

I value the advice of The Old Man above all others. To me, his word is the final word in amateur radio, with all due respect to ARRL officers and directors. And that's why I'd like to see how he feels about these things. Suppose we could find out how the whole amateur fraternity feels about this three-year 'High Power Holiday' and suppose the great majority was in favor of it. Then, suppose we could send a couple of ARRL officers down to Washington to ask the Federal Radio Commission to listen to our story. Suppose these officers told the Federal Radio Commission that we amateurs want to declare a 'High Power Holiday' and that we request the necessary authority which would permit us to use nothing larger than a Type '10 tube in the output stage of our transmitters. There would be no power limit, of course. If some amateur was skillful enough to sock 100 watts out, hats off to him. Suppose we asked the Federal Radio Commission to make such a regulation -- what would happen? There would be set up such a yell as you never heard before -- such a yell that we wouldn't need transmitters; the yell would be heard 'round the world and petitions would grow on antennas. Yes, but if we all agreed to abide by it, what more could we do?

What would we do with all our high power apparatus? Well, what did the Navy do with the battleships when the Ten-Year Naval Holiday was declared? Scrapped them! We wouldn't have to scrap our apparatus -- we could lay it away and if the low-power idea didn't work out for the greatest good of the greatest number, then we could start right up where we left off, and un-

doubtedly with a lot of new ideas for greater efficiency. Any amateur who can afford to buy 250 watt tubes and burn the power for them can afford to lay them away for a time and try the low-power idea. It must be given a fair chance and no half-hearted effort is going to be worth the candle. One year would be too short a time for such a radical experiment. I think that by the time two years had gone by we could commence to appreciate what could be done with such a transmitter and by the time the three years had gone by we wouldn't care a hoot about the high-power transmitter.

The 'High Power Holiday' may be a radical one, but thoroughly reasonable and a practical one. We know that a 250 watt transmitter located in New York is capable of putting a signal into Australia. And, we know that a transmitter using but a single Type '10 tube is capable of doing the same thing. We know that amateurs in some countries use not more than 10 watts of power and yet they put good signals over to us. A 10 watt transmitter of high efficiency is much better than a 1000 watt transmitter of low efficiency, all things considered. Who is there to say that we cannot make our low power transmitters more efficient than anything we have today? Who will say that we cannot discover some entirely new transmitting and receiving antennas and who will say that we cannot develop more sensitive, more selective and better receivers? Who will say that we cannot do satisfactory long-distance communication with the power that can be put into a Type '10 tube? And who will say that such a scheme wouldn't give each and every amateur a better chance to display his knowledge and ingenuity and make him strive for highest efficiency? Well, who would? I believe we have enough frequency bands in which to accomplish these things and to that belief I shall stick until I have concrete evidence to prove otherwise.

Not so long ago I saw a motorboat race in which five motorboats participated. Each boat was exactly like the others, the same size, shape, and weight. The motors were alike, the rudders were alike and each one used the same quantity and the same quality of gas and oil. No changes were permitted, other than adjustment of gas and oil mixture. The race was to see which boat would travel the greatest distance in the least time. The chap who won it actually walked away from the others. Why? Because he knew how to adjust his gas and oil mixture for the greatest power and the highest speed over the greatest distance. Why not try the same idea in amateur radio?

I suppose I am laying myself open to the rankest kind of criticism, but the rankest kind of criticism is of more value than no criticism at all. The amateurs who are using well designed and carefully operated transmitters will agree with me, in all probability. The ones who are using haywire and makeshift high-power transmitters and who are forever kicking about rotten results will yell the loudest. I've seen one or two of these petitions that have been going the rounds lately and the instigator of them will have another job of petitioning--but let him petish to his heart's content. Surely no sane and independent thinking amateur will swallow such rot and forsake the sound principles under which he has been operating these many years.

Remember, this is only a suggestion -- it doesn't mean that we have to do it. It doesn't even have to be decided today or tomorrow--or ever, for that matter. Let's think it over for a couple of months. Let's talk about it at our conventions and let's find out if we think we ought to try it. *QST* is the place to express ideas -- I know of no better place for such expression, and *QST* doesn't have to be crammed full of technical dope each month either. If you have any ideas, express yourself and don't wait for George to do so. George may be waiting for someone else. Do you have a card? Would you be so ex-

travagant and go so far as to risk one? Well, do as you see fit--after all, you are the doctor and as you go, so goes amateur radio.

F.H. Schnell (W9UZ)

Schnell's use of The Grand Old Man whose "word is the final word in amateur radio" was a masterful stroke of literary ingenuity. It provided an underlying foundation of idealism for Schnell's proposal, but not in a dogmatic fashion. Since The Old Man's where abouts cannot be pinpointed physically, he functions as a spiritual source of the values for amateur radio from which guidance is sought. Unlike preachers had done with God and other writers with this mythical father of amateur radio, Schnell carefully avoided putting words in the mouth of The Old Man, limiting his appeal to The Old Man's final authority merely to "I'd like to see how he feel's about these things ... what he thinks of the idea." Of course, there would no doubt in the minds of *QST*'s readers about that: The Old Man had always spoken out against what was bad in amateur radio, and pushed radio amateurs to strive for improvement. His exhortations were the 'scriptures' of hamdom. And in Schnell's "A High Power Holiday", The Old Man was asked to decide between two easily recognizable types of radio amateur: the obnoxious 'watt-hog' 'ether-buster' lambasted by Kruse only 7 years before, and the *New American Amateur* that Kruse held up as the ideal for American radio amateurs.

Schnell's strategy was to maintain a positive tone in the piece, so he only permitted a few direct glances at the 'watt-hog' while using the 'definition by exclusion' technique to imply the rest of the 'watt-hog's' characteristics. That was easy: he was the opposite of everything embodied in the *New American Amateur.* He personified 'high power' and the obnoxious effects it produced. The nostalgic description of spark days in the second paragraph is an inversion of the typical 'good old days' motif: here, the 'good old days' are ruled over by the "nuisance" of the spark transmitter which, if used in 1931, "would blanket two of our amateur bands and wash out all the commercial and government stations in between and both sides." This is the technique of exaggeration used in the literary form known as the 'yarn' which was used so masterfully by Mark Twain and William Faulkner, and other regional humourist writers. The exaggeration must be reduced to a dimension which fits some real known phenomenon: in "A High Power Holiday", Schnell leads us directly to it: "*we are burning a lot of power ... wasting it unnecessarily ... we actually boast and brag about [it], when we ought to be ashamed for even mentioning it...*" And finally, Schnell identifies himself as guilty of such "misguided efforts", a rhetorical technique for deflecting potential animosity and maintaining rapport with the reader. Note that the effects of misused high power are not alluded to in the remainder of the piece: they need not be, since they've already been defined here. What's more, QRM on the amateur bands was universally attributed ever since Maclurcan to the abuse of high power: Schnell did not have to say what every amateur read in *QST*! The 'watt-hog' appears in but two other forms in the piece. He's the amateur who uses "a 1000 watt transmitter of low efficiency". And, again, in the exaggeration technique of the 'yarn': that "such a yell as you never heard before ... such a yell we wouldn't need transmitters; the yell would be heard 'round the world..." comes from the 'watt- hogs'. When Schnell introduced his argument with "the best I can do is *write out my yarn*" he knew what he was doing: a 'yarn' is a *spoken,* not *written,* account to an implicit audience, and he was alerting readers to the fact that the techniques of this literary form were being invoked. Without mentioning one negative fact about 'watt-hogs', he succeeds in rendering them the obnoxious, selfish nuisances of the ham bands. Muckraking, mud-slinging, *"Buncombe, brother, pure and absolute Buncombe!"* Kruse could never have been this subtle!

But Kruse's *New American Amateur* nonetheless provided the ideals offered as the goals of the "High Power Holiday" proposal, which is presented as a hypothetical situation producing several effects: "Suppose we could find out ... Suppose ... Suppose ..." The first three hypothetical steps include a majority of radio amateurs, the ARRL and the U.S.government deciding to support the idea; that produces the first effect of "such a yell...". The 'watt-hogs' obviously are un-democratic types. The remainder of the effects consist of the ideals of the *New American Amateur* which upgrade amateur radio. The criteria for deciding whether to make the 'holiday' permanent is an 18th Century principle implicit in the U.S. Constitution and initially expressed by Jeremy Bentham in about 1810: "if the low-power idea didn't work out for the greatest good of the greatest number..." What democratic American could reject such as proposition? Schnell then backed up his case with reference to the known fact that DX QRP'rs using "not more than 10 watts ... put good signals over to us." From there on, the *New American Amateur* takes over. Given a "*fair chance*", the proposal would "*give each and every amateur a better chance to display his knowledge and ingenuity and make him strive for highest efficiency*", lead to discoveries of "*some entirely new transmitting and receiving antennas*" and "*new ideas for greater efficiency*" and so on. Schnell used the analogy of the 'motor boat race' in the same manner as Kruse's 'Ford flivver vs Pierce Arrow' analogy. And Schnell completed his proposal by identifying those who definitely would support it: "*amateurs who are using well designed and carefully operated transmitters*"; in other words, those who already implemented the ideals of the *New American Amateur*! Schnell's "A High Power Holiday" undoubtedly remains one of the masterpieces of amateur radio literature, not merely because of the view it professes, but because it is superb literature. It is small wonder that it remained in the minds of American amateurs throughout the decade.

The 'Correspondence Dept.' of *QST* became the forum for opinions about the causes and possible solutions for the high power QRM problem. In a letter in the March, 1932, issue, Miles W. Weeks (W1WV) traced the problem to the failure of many high power stations to convert to an adequately filtered power supply ('raw a.c.' which had been outlawed in the previous year) combined with ignorant operators, and described their impact: "*you r.a.c. band-hogs, look out! We have groaned in anguish every time we have heared one of your 'five station broad', DX-defier, hack-saw notes and we won't be sorry to see you wiped out ... it's time you went the way of the spark set -- to the junk heap.*" W1WV awaited the day when the F.C.C. inspectors would eradicate them. He echoed Kruse's and Schnell's assessment: "If we are ever going to solve our interference problems we are going in the wrong direction. Progress points towards better notes and lower power. If we were all restricted to say 100 watts input it would put a premium on building efficient transmitters instead of the tendency as we have it to-day where an inefficient transmitter can be made to get our merely by increasing power and blasting its way through." The successes of foreign operators were again enlisted as evidence: "Witness the situation in England. There they have just those restrictions -- low power and crystal [control]. They work the world without difficulty with inputs under ten watts. If a group of 1500 English hams agree that it is for their best interests to do this, such an argument applies even more strongly here where there are over 20,000 of us." W1WV's letter generated debate in later issues.

W7MF suggested a general movement to lower power and was seconded by A. Stanzione (W8CDT) in the July, 1932, issue, who pointed to the use of unnecessarily high power for local work in a letter titled "QRP": "Let's all get back of this QRP business and rid our bands of a lot of unnecessary QRM. Why

should I, or any one else, be bothered with the signals from a station who is located a hundred or so miles from when he is only working a ham friend in the same town?" W8CDT cited an instance of a QSO between two Philadelphia stations with strong signals (heard in Williamsport, PA): "why should I be QRM'd by such a QSO? ... when it's a waste of power and causes unnecessary QRM and is not needed for satisfactory communication then it's time to QRP." Earlier in the June issue, several other letters addressed the problem. Rufus P. Turner (W1AY- W9FZN) praised the Federal Radio Commission [later the F.C.C.] for instituting a new license exam for a special unrestricted 'phone license and expressed the hope that stricter exams would soon be applied to all classes of radio amateurs: "I look hopefully forward to the day when the amateur applicant will be made to sit down to a rigid technical test, or even to a practical examination, and when *a permit to build an amateur station* will be created and awarded only after the applicant shows that he wishes to erect a transmitter that conforms in particular to modern demands." The station would then be examined upon completion before being allowed to go on the air. G.W. Hudson (W3AEW-ABD) disagreed with W1WV's suggestion that power be limited, and offered an idea similar to Turner's: "...to eliminate some of the QRM ... have anyone using over 75 watts here to pass a special examination in person before the Radio Inspector. This examination should cover the use and maintenance of high power apparatus." After noting that English operators could qualify for special licenses permitting 150-watt operation, Hudson summarised: "*It is not a question of high power, it is how the transmitter is built and the operator behind it.*" Hudson's association of the culprits causing the high power QRM with in competent operators was a common one. Kruse would have agreed.

And Tom Rubik (W9ICP) rounded out the comments by suggesting scheduled times for alternating QRP and QRO operation. He probably spoke for the grassroots low power operator mentioned so frequently during the decade: "*Being a beginner and using a 7-1/2 watter, I find that 7-1/2 watts cannot compete with 200 watts ... Why not also divide the time for low and high power stations? This would give the low power stations, who are often beginners, an even break for DX QSO's. More than one of the newcomers is beginning to feel disgusted because of the QRM and too much competition with high power. This scheme would also be a boon to the high power stations because they would not have to deal with 'pesky* beginners'." Sentiments like Rubik's were probably what F.E. Handy and E.L. Battey referred to in their defenses of the low power operator 'whose name is legion' during the mid-1930's. The 'disgust' felt by beginners apparently endured and the staff included a 'Stray' in the January, 1940, issue on the problem: "For the reassurance of the low power beginners who receive advice to the effect that present day operation requires high power gear, W4FRU of Memphis, Tenn., sends this note: '. . . I worked W5EWK of Tom Bean, Texas, who was using as his xmtr a '19 tube in a Hartley oscillator with 3 watts input. His report in Memphis was RST 589. W5EWK's antenna is a 66-foot grounded (Marconi), and his receiver is a 2-tube outfit using '30's'." It is reasonable to assume that most beginner's entered amateur radio in the 1930's at this power level, judging from the fact that transmitter construction articles specifically aimed at beginners were always in the 10-20 watt input range.

A significant development in receiver technology in 1932 gave a new twist to the anti-QRO and pro-QRP sentiments among amateurs. *QST* Technical Editor Jim Lamb (W1AL) introduced amateurs to "The Single Signal Superhet" employing a highly selective crystal filter in the i.f. section. This receiver's ability to reject unwanted signals was perceived as the ultimate improvement in receiver selectivity: it was the best weapon that technology could provide against the QRM generated by the 'watt hogs'. And yet, it failed! The situation is similar to

that of the late 1960's and 1970's, when Wes Hayward (W7ZOI), Doug DeMaw (W1FB), and Ulrich L. Rohde (DJ2LR), among others, struggled with the problem of high dynamic range in competition grade receivers in the presence of incredibly powerful QRO signals on the ham bands. Of course, the superhets of the 1930's, in comparison, were primitive, insensitive, barely selective receivers, yet the results were the same. No receiver can handle excessive input powers. Ergo, eliminate the QRO signals from the bands.

This argument first appeared in a 'Letter' in the July, 1933, issue of *QST*. In closing his letter, titled "Receivers vs. High Power", E.R. Jensen (W9FVR) appealed to Schnell's proposal: *"What ever happened to the idea of 'High Power Holiday'? Let's have it -- by making high-power unnecessary."* Jensen attempted to prove that point by reviewing his experience with the 'Single Signal Superhet': "It is after becoming thoroughly acquainted with this receiver that I feel justified in saying that the QRM situation in the present 'phone bands is due very much to the mistaken belief that a high powered transmitter is the only requirement for 'getting out' through the QRM." This belief overlooks the logical extension of its premise: "another strong carrier on the already crowded bands is only making matters worse, and ... results will be obtained only as long as the average power used by amateurs remains less than our own power. When most of the boys (who have the dough [*i.e., money*]) are using the maximum power allowed to hams, what are they going to do next to pierce the QRM? When that time comes, surely they will realise their folly." But that time was never to come, at least not yet! As noted below, W9DZG, for one, still could rely on increasing his power as a solution to the QRM problem!

In Jensen's view, the selectivity and sensitivity of the superhet rendered high power superflous, permitting solid copy of previously undetectable signals: "I find that with this receiver, about all that is necessary for reception is the presence of a carrier, be it ever so low in power. I have received 5-and 10-watt 'phones [*a.m. 'phone signals*] on both coasts on the 160-meter band QSA5 [*i.e., perfect copy*] early in the evening, when the high powered babies give them a chance to get through." In one instance, Jensen noted, "three DX stations were coming in QSA5 [*band is not specified*], side by side, with no QRM to each other, when a 250-watt carrier came on top of them and put them clear out of the picture ... no more was heard until the high-powered boy flipped his switches off again." Without the QRO stations on the band, "I have been able to hear *all districts* on 160 meters before 9 p.m. On my old job, I could only hear 9's and 5's consistently, with occasinal reception of higher powered 8's and an infrequent 2 or 3 [*refers to call districts*]. Where I used to get nothing but a pile of heterodynes, I can now pick out readable stations." Jensen then substantiated the claim that high power was unnecessary with the advantage of the new superhets by citing his own results: "The transmitter power at W9FVR is about 25 watts. Since putting the super into use, the number of contacts has been increased some fifty percent... With a good receiver, a 10- to 20-watt carrier is ample to reach any place in the good old U.S.A., so all power over that amount is good for nothing but QRM." Jensen made his major point thus: *"Receiver sensitivity and selectivity can be increased to an unknown limit without adding to the present QRM. Transmitter power can be increased to a very definite limit, with the sorrowful result now evident on the ham bands"*, and advised: "To you fellows with the jack, if you must spend it spend it on receivers; give the 10- and 20-watt 'phone a chance, and note the improvement in the QRM situation."

Jensen's letter struck 'a responsive chord' in I.W. Copeland (W8GGD, *ex-8JM*) who added his support in the November, 1933, issue to Jensen's position. W8GGD noted that his experiments with various types of receivers across the years have led to: "the conviction has steadily grown that the solution of better-

ing DX was in reducing rather than increasing transmitter power." After seven years off the air, "some old parts were soldered up into a little c.w. and 'phone transmitter with one poor little 210 tube with 25 watts input instead of the pair of 100-watt bottles which had been used before. Due to the vast improvement in receivers and tubes, this little tube steps out just as well as the big boys did." His conclusion was the same as Jensen's : "So what is the use of causing a lot of grief for the other fellows for a hundred miles or more around, whose perfectly good little signals can be received over what a short time ago was considered unbelieveable distances, when given half a chance and not blanketed by some high-powered bird who may be only working a station in the next town?" Together the two letters create the impression that the grassroots was operating at similar power levels and suffering the same plight at the mercy of the 'watt hogs'.

Without pointing a finger, 'Communications Dept.' Editor F.E. Handy (W1BDI) and his assistant E.L. Battey (W1UE) gave hints about good construction and operating practices aimed at reducing the QRO QRM. In the November, 1933, issue, for example, they noted the approach taken by W8JSU who "instead of building the P.P. TNT [*a medium power transmitter*] and running a risk of jamming the bands and adding to the QRM, decided to assemble a small two tube crystal control job, low-powered, and to work constantly with a monitor, spending most of his time getting a good, clear crystal signal which would not jam the bands." They supported W8JSU's contention that "it is the good piercing signal that cuts through the QRM like a knife through cheese and gets the most responses," and urged readers: "*Why not try, fellows, to improve your signals, instead of increase your power.*" Handy and Battey continued to publicize the successes of low power work throughout the much of the decade by inviting the submission of 'records', as we'll note below. Ironically, the fine-print divisional report from Oregon includes that familiar item: "W7AIP has bigger and better rig": Handy didn't succeed in getting through to his own SCM's!

In the November, 1935, issue, the *QST* staff supplemented the sentiments which had been expressed in previous years about the 'watt-hogs' and the problem of QRM by offering a solution in a feature article by George Grammer entitled simply "**QRP**", the first article title of its kind. However, it was not about QRP as such. It merely explained a variety of methods that could be used to reduce QRM, *i.e.*, reduce power output. High power and QRM were synonymous in this article. Grammer opened with a reference to the general concern with the problem: "When a couple of hams get together one sure-fire subject is QRM." The acquisition of a single signal superhet is not the solution, since "there are still lots of us who haven't the means to get such a receiver." That limited the solution to "looking around for methods of reducing QRM at the transmitting end." Grammer went on to draw an analogy between the high power QRM problem and the earlier struggle aimed at eliminating QRM caused by less-than pure d.c. signals, and delineated the difficulty in motivating operators: "One deterrent to reducing power is that it's something that doesn't so ostensibly benefit the fellow who practices it -- it mostly helps the other fellow ... It tooks years and years to get across the idea that a d.c. note took up less space ... largely because it meant taking a little more time and trouble in adjustment, and the world at large instead of the individual concerned was the primary beneficiary." The high power operator, in other words, was selfish and lazy in placing his individual interests above "the world at large" or "the greatest good for the greatest number" in Schnell's terms. Grammer's conclusion extended the 'local work' to a wider context: "How far should one go in reducing power for local work? The answer to that one is the same as to 'How far is up?' The safest bet is to follow the rule that's still in the [F.C.C.] regulations -- *use the least amount of power that will cover the distance satisfactorily.*" The emphasis on 'local work' found in many of

the comments about QRO QRM arises from the fact that a majority of operators used regenerative detectors as receivers. A strong r.f. signal at the input overloaded such a receiver and 'desensitized' it, pulling the receiver oscillator onto the strong signal's frequency and rendering reception of other signals impossible. In other words, it resulted in cross-modulation of the worst kind. (See A. David Middleton's description of the problem and a solution below in "Perfect Summer Plus QRPp", Chapter 8). The effect of Grammer's comment was to remind readers of the obvious, well known fact that high power also caused QRM beyond local areas. And his final line was a direct slap at the inconsiderate 'watt-hogs': "Why not use five [meters] or ten [meters] for locals and give yourself, as well as everyone else, a break?" The fact remained that, even if the 'watt-hogs' cut power for local contacts, their use of high power for long distance work still caused a QRO QRM problem "for the other fellows for a hundred miles or more around" as Copeland put it. Foreign operators such as XE2FC would have extended that to 'thousands of miles around'.

Another interesting twist on the 'lower your power' theme surfaced in a letter in the November, 1935, issue from Saul Kron [*no call given*] of Passaic, NJ. The 'R-S-T' system had been in use for about a year, and Kron thought that a further refinement would benefit the QRM situation: "I have often wondered if the power input of stations couldn't be used to advantage [in exchanging reports]. Coupled with the R-S-T report, it would give operators an immediate knowledge of the efficiency of each other's station and also indicate general transmitting and receiving conditions using the miles per watt basis." The resulting signal report would affix the input power to the R-S-T and read thus: "Ur RST 469X P32 [*'X' = pure d.c. tone*]", where 'P' denotes 'power' followed by wattage. Kron's suggestion was a thinly disguised effort to embarrass the QRO boys into QRP'ing. The use of the system "may even lead to a trend of reducing power input rather than increasing power" since "a great number of amateurs like to boast of pushing a signal as far as possible with as little power as possible." Kron's psychological strategy emerged clearly in the explanation of how the system would reduce QRM: "Considering the splendid work done by the foreign amateurs with small power, the high power boys might be shaken into realizing that high input and low efficiency isn't anything to brag about. Thus, with the stating of each other's power input in the exchange of reports, the high power users might be ashamed to state that they are using 400 or 500 watts when the ham at the other end is using only 30 or 40 watts." Of course, Kron ignored variables such as propagation conditions and antenna gain, but then his objective was not entirely altruistic!

The "Receivers vs. High Power" issue surfaced again in the February, 1937, issue of *QST*, this time in the "Article Contest" section which featured two articles each month by rank and file ARRL members, selected by the *QST* staff (presumably F.E. Handy and E.L. Battey, since it was part of the 'Communications Dept' column) for their relevance and value. G.H. Johnstone (W9CRU) was one winning author, and he too invoked Schnell's "A High Power Holiday" in making points similar to those expressed by Jensen and Copeland. Under the title "You Must Hear Them First", Johnstone began: "It is a known fact that a receiver is not one of high or low power in the sense that we rate transmitters. It is equally well known that the sickly 201-A putting out its under-nourished watt and a half at Gopher City, can be heard in Asia, IF the Asiatic has a sensitive and selective enough receiver. The above statement deserves thought by all hams. Why? We are constantly endeavoring to make our contacts more reliable, our trunk line skeds [*the ARRL traffic nets*] as near fool proof as possible. To go back a bit -- Schnell proposed a 'high power holiday' which didn't seem to take hold very well. I think that the idea had merit. Am I suggesting another? Nay, brother, stuff that sky wire as full of healthy nourishing watts as you wish. We will still hear that

little one and a half watter in Gopher City." Johnstone's main point is simple: "You can't work 'em if you can't hear 'em", and he advised "Instead of building a high-powered final, invest in a really good receiver ... Getting the receiver will do two things for you -- eliminate the 'QRM' from existing high power rigs, and give you greater opportunity for DX QSO's. It is surprising what a properly handled rig with 25 watts output will do, IF you can hear the ones that answer you. And don't forget, there are as many low powered foreigners as there are Hi-powered domestic rigs." However reasonable Johnstone's theory about eliminating high power QRM seemed, it simply did not work that way in practice.

While the enlistment of the superhet receiver as a weapon against high power QRM had theoretical merit, it was met with skepticism by many. An exchange of letters in three issues of *QST* in 1937 provide insight as to why that was the general response. In the June issue, Charles W. Finnigan (W2BJQ) criticised foreign 'phone stations for operating "*outside the American 'phone band to avoid* interference" on 20 meters. W9BJQ's solution was typically patriotic: get the Cairo allocations conference to force foreign 'phone stations, especially Mexicans and S. Americans, to operate within the American 'phone segment, thereby eliminating QRM from the c.w. segment. In responding to W9BJQ in the August issue, R. Villasenor (XE2FC) began by making two points: (1) "*he forgets to mention (purposely, perhaps) that the VE's, VK's, PK's, J's, some of the K's and most all of the European hams also operate 'phone outside the 20-meter American 'phone band*"; and (2) "*W2BJQ probably ignores the fact that we Mexicans and South Americans also live in a free country like his. In accordance with the international treaty regulations ... we operate ... within the frequencies that have been assigned to us by our own Governments.*" In explaining why foreign 'phones choose not to operate within the American 'phone segment, XE2FC reveals the foreign experience of the American high power QRM problem:

> *"... who wants to go in there with the big "American kilowatters"? Even Mr. Finnigan himself would feel sorry for us with the low power that we use. What chance in the world would we have of ever making a QSO? Most of the American 'phones that I listen to are very efficient and sound wonderful. They are very powerful and I admire them, so you can imagine what would happen to my low power sigs inside of their band. They would be an easy bite for the 'big sharks' Hi! I guess the rest of the 'Foreign Fones' feel that way too. The American 'phone band is overcrowded as it is, and just suppose that all the the 'phone stations in the world were thrown in there too. What would happen then? What chance would anyone have of ever working a DX station?"*

Villasenor then concluded with a plea to "practice the right definition of the word 'tolerance'." E.G. Bowden (W5CHU) supported XE2FC's position in the October issue:

> *"I would like to add a few words from this side of the fence. In the first place I appreciate, as well as a good many other fellows I know, the fact that the 'Foreign Fones' are out of the American 'phone band. While I enjoy QSO's with as many W stations as I can work, there comes the time when a little 'phone DX is a pleasure, and I ask you how could we ever hear these low powered DX stations if they were mixed in among the kilowatt American stations? I have had a number of FB QSO's with XE2FC, as well as VK's, PK's and VE's, who were out of the American 'phone band using as low as 14 watts! I don't think these QSO's would have been very successful had they been in the 14,150 - 14,250 section of the band. I am glad their governments allow them to operate where they do and hope they stay there."*

Hopefully Bowden's letter did something toward repairing the image of the American radio amateur presented in Finnigan's letter. While the high power QRM problem was frequently discussed in the context of 'local' QRM, it ob-

viously was anything but a restricted problem. It appears that the rest of the amateur radio world agreed with W1WV's conclusion: "It is really a matter of self-preservation" in the presence of the 'big sharks'.

The attacks on the abuse of high power and unnecessary QRM persisted until the war brought an end to amateur operation. One of the final shots was fired by Harry K. Long (W7CQK) in the July, 1940, issue who reminded amateurs of the "forgotten or neglected section 324 of the F.C.C." regulations: "It is still in effect *[and still in 1987]* ... In effect it says that *all* stations must use only sufficient power to insure satisfactory communication over the given distance and under the existing conditions. Now we can't possibly stick to this rule with engineering precision, but we can do something about the abominable practice of using 500 watts or more for those cross-town round tables on 160 meters ... if we are going to spend the evening talking to the next door neighbor or the friend two miles away let's use a low power rig -- say a two stage plate modulated rig running 3 to 10 watts input. My 6F6 final with 5 watts input gives me very nice reports on 160 'phone at distances of 50 to 100 miles ... and does not interfere with stations across the state during the busy hours..." In the previous issue, Earl R. Linder (W9DZG) gave the other side of the story from a guy who tried it and found it to be a lot of 'bunk': "The numerous articles and letters appearing from time to time in *QST* regarding the joys derived from using low powered transmitters finally got me. I built a tiny mite of a code squirter for 7 Mc. and I built well. So what happened? I raised 'em from Maine to California and back again, with practically no power at all. Great stuff, only with few exceptions the amount of intelligence conveyed in these low powered contacts was confined to getting the calls OK and a hazy remark or two about QRM. Then the inevitable, 'Sorry OM lost u in the QRM c u agn 73'. Where before I enjoyed solid and intelligent chats with the 40 meter crowd, I now had spotty and vague contacts. Unfortunately, I am not one of the leisure chappies; having to work for a living, my operating time is necessarily limited. During the time I do have for getting on the air I want good solid contacts, enjoying ragchewing above everything else in ham radio. This simply cannot be done with mouse powered toys..." The 'leisure chappies' who presumably did not work for a living could continue struggling along with low power, but no more of that for W9DZG: *"Anyhow the 500-watter is back in operation, and if the blinking lights can be made to behave I will have 'er up to a full kw. shortly."* That would solve the QRM problem ... for W9DZG!

Chapter 7
QRP Gains Ground: 1930's

By the 1930's, great exploits by QRP operators were no longer front-page news as in the 1920's. For one thing, the expeditions to the far corners of the earth carried high power shortwave transmitters. And it was common knowledge that QRP regularly accomplished power vs distance feats that were considered phenomenal in the early days. Hence, *QST* of the 1930's continued to encourage and publicize QRP achievements, but in a low-key manner, except in a few instances where QRP attained 'feature' space. Short items about QRP records appeared in 'Strays', 'Correspondence', and the 'Communications Dept.' and 'How's DX?' conducted by F.E. Handy (W1BDI) and E.L. Battey (W1UE) until about 1938.

I. Without Fanfares: The Low Power Work Goes On

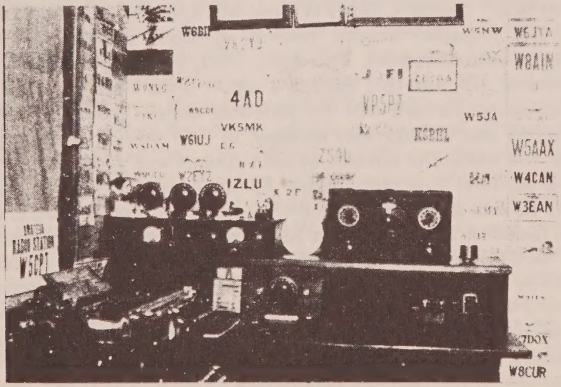
"...Try your hand at low-power work this fall,
if you have never tried it before -- and let's hear your results..."

Handy and Battey responded readily to member comments and took every occasion to record QRP doings. Their attitude finds occasional expression in the 'How's DX?' report which was part of the 'Communications Dept.' column. Handy noted, for example, in the February, 1937 installment: "*Consider for a moment the pleasures of low power. G5CM, for example, worked ZS1H, VK2GU, U9ML, VE4PH, W6KBD, W6HB, W6JJU (three times), and W9's galore, on 28 Mc. with 7.5 watts input to an E.C. 59, and has successfully worked W3PC with only 2 watts input! -And Miss Barbara Dunn, G6YL, is WAC and WBE on ten with only from 6 to 10 watts input. Miss Dunn chooses a frequency higher in the band than most, so don't be afraid to go looking for her...*" *[G6YL was one of the QRP pioneers in the U.K. Her original logs and QSL's have been preserved. What DX with QRP! Many of her QSL's, such as several from India, give us a picture of foreign operators as genuine 5-watt and under QRP types. This material will be forthcoming when G4BUE does the history of QRP in the U.K.] In another issue: "Anytime we can give one of the QRP gang a plug we like to do it. G8SD for example, goes merrily along with 1 watt input (100 volts at 10 mils), but he works across the pond pretty well, according to W1ESN. Of course, 48 watts isn't low power, but W8LED's story is interesting because after 3-1/2 years of going after Oceana, his first contact there is with VK6SA, just about the toughest VK district. This 48 watts have accounted for 45* countries...." In the April, 1938, issue: "*Next to working a new country, one of our greatest pleasures is being able to tell about some good low power work. W9AHR is the same sort, and he tells us about a fellow in Kansas you ought to know. W9DSR, using 1-1/4 watts input on 160 'phone, worked 32 states, including California, Vermont, and Florida. Just to rub it in a bit, the work was done during the evening and not the less crowded early morning hours. The final is a '19, modulatd by a '49. QRO to 9 watts, and moving to 28 Mc., he has worked K6MVV, VK2GU and such. Jeeves, what was our power bill last month? It was? Hmmmm... Better drop the input to 900 watts.*" And in May, 1938: "*W9WSY has a 4 wavelength Vee beam for Europe but that isn't all. He has a low power record that is something: a QSO with G6YR on 10 meters using 22.5 volts at 2 mils to the final 807, which figures out to be 0.45 watts! Lee was RST 579 with 50 watts, 559 with 0.5 watts, and 439 with 0.045 watts. The only way to beat that one is to work somebody with the filaments turned off!*"

Byron Goodman (W1JPE) took over 'How's DX?' in 1937 and continued the coverage of QRP in the July, 1937, issue: "*W9RBI thought he would try a little of*

this QRP stuff the other day during a 14-Mc. 'phone QSO with 1DNI. The final is a T55, but by taking off the regular power supply and ending up with the 6-volt tap of a dead B battery, he was running 0.02 watts input and was still RS43. It figures out something like 50,000 miles per watt, on 20 'phone ... This QRP stuff isn't the bunk. We worked the fellow W5CPT [a well known QRP DX'r whose station photo was featured in 'How's DX?'–see below] the other night and had a swell chat. His 8 watts was bouncing through in fine style, a good S7. Latest DX there is J3FP (Japan), J3FZ, PK1XB, PK4KO and KA1ER. WAC 12 times, and 47 countries ... and to clinch the case, W3GHB work ed J2CC with a crystal oscillator, doubling in the plate circuit..." In the September, 1937, issue: "*W6IES has worked ZL1DA with only 0.9 watts input to his final, but usually runs 600 watts. The low power stuff was 90 volts at 10 mils to a 35T ... Speaking of low power, W6CIS says that PK1RL uses only 2 watts input to a 58 oscillator, and a Vee-beam. We would never have guessed it, the way he comes through on the east coast...*" and in October, 1938: "*In the low power contingent, W3EYF reports an average report of S7 in the DJDC [contest], using only 35 watts to his 807 exciter, while W5FIT made his WAC with 25 watts to a 6L6 Tritet and a Q antenna...*" Goodman initiated the DX Century Club in the September, 1937, issue, and the listing for July, 1938, provides a context for measuring QRP DX successes noted in 'How's DX?' of the period. Five operators stood at between 120-130 countries, with 28 in the 100-119 range. W5CPT's 47 countries was not all that poor a showing! The interest shown in QRP work in these DX columns would continue to provide publicity for real QRP for many years to come.

"The QRP Station of Emmett Simmons, *W5CPT* **of Clarendon, Texas.** *The transmitter is a 78 Tri-text oscillator driving a '12A final, with 8 watts input from B batteries. With it Mr. Simmons has worked WAC four times, and has worked five continents with 0.1 of a watt at 45 volts! There is nothing unusual about the installation except that a 2 wavelength 'Vee' beam is used. W5CPB, who sends this information, says, 'And I'll tell you it gives one an odd feeling to hear Europeans giving an 8-watt station better reports than you get with your 500 watts. One is forced to admire a fellow that makes 8 watts do the work of 800'."*



Handy invited the submission of results of QRP work in the May, 1933, issue in the 'Communications Dept.' under the heading **'Low Power Records'** as this material was often described. In that note, Handy reported that "*W2BJZ suggests that it would be a very good idea to compare the records of all hams using below 200 volts for plate supply, to see just what 'flea power' can do in each of our different bands,*" and went on: "*Who has the miles per watt record for DX (two-way QSOs) on 1715 kc? 3500 kc? 7000 and 14,000 kc?*" He invited QRP'rs to "*send us*

your DX-record, if you have operated a set which can be classified as 'low power'. Give us the data on plate current, plate voltage, and enclose the QSL you received confirming the work." It appears that Handy meant 'record' literally, but he also was interested in reports: "*Try your hand at low power work this fall, if you have never tried it before -- and let's hear your results.*" He included some reports he had on hand:

> *Here are some items of interest regarding 'low power communication': W1EZ, Pownal, VT, in contact on 35. mc. at 2:10 p.m. with W1APQ, Hampstead, NH, cut power to 15 volts at 2 mills was QSA4 R3 at W1APQ. -G5UM was in communication wih G2ZN, about six miles away on the 1.75-mc. band. G2ZN reduced power, and when using 10 volts at 0.5 MA was QSA3 R2 at G5UM. This is about 1200 miles per watt! G2ZN was also heard R3 by G5RS when using 0.35 watt, about 1000 m.p.w. -One evening at 8 p.m. W3CMQ contacted VE3JS on the 3.5-mc. band. W3CMQ was using an '01A [201-A] with 180 volts; VE3JS was using a 199 with 150 volts! -During the 1932 DX tests W2DEE was heard in Germany on the 3.5-mc. band. Looking back in his log he finds that at the time he was heard he was using a Type '26 with 450 volts on the plate, 50 mils current, 2.5 volts on the filament. A 7-mc. antenna was used at the time with 15-foot zepp feeders. Who said it didn't pay to keep a log?*

Apparently Handy was not disturbed by G2ZN's 'bogus' QRP record, but it was QRP information nonetheless. Elsewhere in the same issue, another QRP 'record' appears in 'Strays': "*Speaking of miles per watt records, W9IDW in Yankton, SD, worked W8BOW in Wheeling, W.Va., with 45 volts and 6 mils on a Type '10 on the 80-meter band, which figures out to more than 3000 miles per watt. The actual distance is about 900 miles -- quite a respectable achievement.*" Ironically, on the opposite page appear two photos of featured station W8AFM: four rows of racks each 4 shelves high covering most of a wall!

The 'miles per watt' theme may have been suggested to Handy and Battey by the announcement in the February, 1932, issue of the "*British Columbia 'Miles Per Watt' Contest*" which was sponsored by the British Columbia Amateur Radio Association for April 1 to May 1, 1932. Handy noted: "If, between those dates, you hear any 'VE5' calling 'CQ MPW', you will know he is in the contest and is looking for DX contacts." Several 'records' appeared prior to the above 'Low Power Records' announcement. The April, 1932, issue reported *W9GIG's miles per watt record of 675*, and that elicited a report from VK3HL in the August issue: "*VK3HL comes forward with the following dope: On January 19th VK3HM was QSO ZL3DI and ZL4BS with an input of 0.54 watt! A Type '01A was used with 90 volts at 6 mills. The distance of each contact was 1560 miles or 2888 miles per watt. Both contacts took place on the 3.5 mc. band. ZL3DI reported VK3HM's signals QSA5 R5 and ZL4BS QSA4 R5.*" Shades of the 1920's VK-ZL QRP work! Later issues included 'Miles Per Watt Records' occasionally, as in the November, 1935 issue: "*W5CPT reports a miles per watt record, which may be an all-time high. On April 14th he worked W9GGB, Danville, Ky., about 912.2 miles, reducing power to 4 volts at 2 ma., or 0.008 watts. This figures about 114,000 miles per watt! W9GGB reported the signals RST 229, frequency 14 mc. Earlier records made by W5CPT included a 10,365 m.p.w. QSO with W9GGB, a 30,000 m.p.w. contact with W9FAV, both on 14 mc., and an 8000 m.p.w. QSO with W5AMK on 7 mc. This latter is W5CPT's best 7-mc. record. -A low-power test at VK3PG with W6CUH on the receiving end resulted in an 80,000 miles per watt record. VK3PG was R7 at 4 watts, R3 at 0.54 watts, and R1 at 0.09 watts (45 volts, 2 ma.). This was on 14 mc.*"

At times rare QRP items would creep into the fine-print of the 'Station Activities' section, as in the May, 1934, issue, where we learn: "W3CRB has worked all 'W' and 'VE' districts with 10 watts input. -W9BWU worked 135 miles with 135 volts on 'phone. -W9HWD tried flea power 'phone on 3.5 mc. -W9NGS uses

flea power. -W9KNH has low power 14 mc. 'phone. -W9MND worked a K5 and Mexican with 5 watts on 14 mc." The complexion of the reports did not change much during the decade: the bulk of references are to high power. The reports in 'Station Activities' in the December, 1939, issue is about the same as in 1934, with these items scattered about: "W8RQM has a 10-watt rig in his car for 'phone and c.w. -W9EQH got quite a thrill by working K6QMC [KH6] on 7 Mc. and receiving a 589X; he sure tromps around with his 25 watts. -W5HBB increased power from 3 to 20 watts on 7 Mc. -W9BIU worked 30 states - all districts - on 7 Mc. with a 6L6 in a month and a half. -W9BVL works 7 Mc. with 'QSL-40' [*6L6 rig*]. -W9CDL has been working out FB on 7 Mc. with only 10 watts input." Interestingly enough, the proportion of QRP to QRO references actually increased in post-war years.

II. QRP's Few Brief Moments on Stage

"...The name of the low power man is legion, and we believe it is time we dedicated an activity to this whole group of operators, with a fair limit that does not invite competition from high-power stations..."

The low-key publicity given to QRP was complimented by feature items throughout the 1930's, ranging from the two contests sponsored by *QST*, coverage of Field Day and 'Sweepstakes', articles on QRP rigs, and other features. In this manner, the *QST* staff kept the ideals of the *New American Amateur,* which were embodied in QRP operation, before the eyes of radio amateurs. The definition of 'low power' remained rather flexible, depending on the context, but by 1935 or so found some stability at around 20-25 watts input. Genuine QRP at the 5-watt level was commonly referred to as 'flea power'.

The first of these contests was not actually designed or announced as a QRP contest, but the basic underlying idea was the familiar miles per watt standard in slightly modified form. The 'Consistent DX Contest' of June 5-18, 1932, set the objective of seeing which stations could rack up the best "total mileage" for their 20 best contacts, and used the usual three power categories, with the 'low power' one limited to 50 watts or less input. Operating was limited during the 14 day period to the 160, 80 and 40 meter bands. Major interest resulted in the 'low power' category which drew 52 entries, while the 'medium' drew 23 and the 'high power' category drew only six. The list (*QST,* February, 1933) included three genuine QRP entries: W9DBO with 7670 miles at 2.16 watts and W1CSV with 2762 miles at 1.5 watts on 80 meters, and W5PR with 2011 miles at 7.5 watts input on 40 meters. Other low power entries included: on *80* meters, W8EEQ (1770mi: 12w), W7LD (9495mi: 15w), W9HUO (6901mi: 15w), W1EFM (4147mi: 15w), and W9HNM (3775mi: 18w); and on *40* meters, W7CEB (17,125mi: 5w), W8GME (8915mi: 16w), W9HNM (12,265mi: 18w), and W4AQV (22,540mi: 20w). High score on 80 meters was W6AW (31,225mi: 50w), and on 40 W4AKH (18,0470mi: 45w). Battey remarked on these results: "*W9DBO with only 21.6 watts input has a 'total mileage' of 7670, well above some of the stations with considerably higher power. W1CSV, with 1.5 watts, totalled 2762 miles!*" One clue as to the devious purpose of the contest appeared in Battey's 'conclusion': "*Note that the scores of the 'low power' group on 7 mc. compare favorably with the 'medium power' stations; and the 'medium power' stations did as well as the 'high power'* entrants." Or, *A = B = C, Ergo* who needs high power (or even medium power), since it makes little difference. In case some missed the equation, he added: *"The list of scores speaks for itself ... If nothing else, this contest shows that 'power isn't everything'!"* It is difficult, nay impossible, to believe that Handy and Battey were surprised at such results. The contest showed what it was intended to show from the start!

The annual 'Sweepstakes Contest' gave prominent publicity to QRP operators throughout the decade. E.L. Battey (W1UE) usualy wrote up the results of this major contest and often approched Kruse in the emphasis placed upon low power successes. His reports provide some illuminating statistics as well. The 'Sweepstakes' included three power categories: low, medium and high power, and while the low power category officially was defined as 'under 100 watts' and carried a power multiplier of x1.5 (until 1938 and x1.25), Battey refrained from commenting on any station running above about 40 watts input, and reserved his hardest hitting notes for the 'really low power' stations equivalent to modern QRP power levels. Most of the reports (up to 1939) included a separate section of analysis usually titled 'Low Medium Power Achievements' where Battey sounded the praises of QRP'rs and the QRP philosophy as well. In this section of the 1933 contest results (*QST,* May, 1934), for example, Battey began: "*The Sweepstakes is one contest where 'low power' is not a handicap to getting full enjoyment from participation, nor does it prevent one from running up a good score, even a winning score. Operating ability and judgment have proven of much greater benefit than power in practically every instance.*" Following the QRP results for the 1935 event (*QST,* May, 1936), Battey commented on successful operating techniques in a manner to Hatry in the 'Low Power Reports' of the 1920's: "*The possibilities of low power are too often under-estimated. The reason that the above champions of low power get results is that they have confidence in their signals. The old adage 'You've gotta make calls if you wanta get results' is particularly true on low power -- but don't be afraid to make the calls . . . you may be surprised at the DX you can raise. The practice of calling anything you can hear is a good one to follow.*"

The summary of low power results was preceded in 1934 and 1937 by a table of statistics on the types of final amplifier tubes used by entrants, the purpose of which seems to have been to emphasize the predominance of low power entrants. In the 1933 contest, 28% used a single Type '10 rated in the 50-watt range (although one 'watt-hog' noted in 'Station Activities' was able to pump 225 watts into a pair!), and 10% used a pair of '10's, or 38% overall. The Type '10 was viewed as the upper limit of 'low power' at the time (recall Schnell's reference to it), and Battey drove the point home: "Note that only about 12% used tubes larger than the type '10 in this contest, and witness the scores! In the 1936 contest, 15.2% used single '10's and 16.6% used a pair, for a 32% total. By this time, the new 6L6, the workhorse of the 1950's, had appeared and accounted for 2.2% of the entrants. From a historical perspective, the most interesting revelation of Battey's summary is that 0.6% were still using the pioneering 201-A and a few '199's showed up as well!

Battey launched into the 1934 low power results in a manner reminiscent of Kruse: "*Should there be any 'Doubting Thomases' the low power really can do it, we request that they inhale the following dope on actual accomplishments.*" The 1936 comments stressed echoed the complaints about the movement to high power: "*The records of a few operators who used what can really be termed 'low power' are refreshing in this game where the common urge is to run the power up, up, up. . . .*" The *QST* staff of the 1930's was just as chagrined about the abuse of high power as in the 1920's, spoke out about it, and eventually sponsored contests to attempt to stem it. What is most interesting to us are the QRP achievements noted by Battey. (It will help to put the QRP scores into context: high score for the 1933 event was 62K, followed by 61K then 50K, six in the 40K range, and 19 in the 25K-40K range. Anything over 20K was considered worthy of special commendation.) He summarised: "*W8AQE operating on 3.5 mc.made 5616 points. 27 sections, with '33s in a crystal oscillator (200v. B batteries on plates, 35 m.a.)! -9553 points (41 sections) is W8FDA's record using a '71 TNT [circuit type in caps] with 200 volts 'B' batts! -W1DUJ, with a single '71 TNT, made 4433 (31 secs.).*

-Among others in the 'ultra-low' power class were W5BD ('12A TNT 180 v.), W5CPT ('12As P.P. & 201-As P.P.W. 4 watts input), -W1CGV ('12A xtal. osc., '12A amp., 5-6 watts), -W8JGN ('201-As TPTG 2 watts), -W4BMH ('201-A 3 watts), -W8HOS ('201-As 180 v.) -W9PJT (4 watts), -W7BRU ('47s, P.P. TNT - 150 v.)". To this list of real QRP'rs, Battey added: "*Did some one say, 'Where are the winning scores you claim for low power?' OK, listen. -W8BGY, Michigan leader (31,197), used only 35 watts input to final stage. -W8GUF, Western Penna. leader (30,520), used '45s P.P. TNT, -W4PL, Tennessee leader (22,002), used a '10 final stage. -VE5HQ, B.C. leader (21,518), used a pair of '10s in final. W9DMY, Nebraska leader (17,264) used a '10 in final. -W9GWK, Wis. leader (26,376), used a '10 self-excited, -W9DMA, So. Minn. leader (18,090), used two '10s. -W9EMY, N. Dak. leader (7878), used '46s P.P. final ... -W3AKU, Eastern Penna. second-high (12,810), used only 40 watts input. -35% of W1COI's contacts were made with 7 watts input on 3.5 mc., 15% with 25 watts on 3.5 mc., and 50% with with 35 watts on 14, 7 and 3.5 mc. His score was 9360.*" Two other real QRP'rs received special mention in the 'Phone Participation' section: "*W9ACU's 10,010 points were made using phone exclusively in the 3.9 and 14 mc. bands within an input to the final stage of 10 watts. A real record for low power! The final stage at W9ACU employed a '12A drawing 50 m.a. with 200 volts on the plate.*"

The 1936 results included details on several real QRP'rs in the 'Low Power Accomplishments' section: "*-W1JAH using a 6L6 e.c. osillator running at 3 watts input worked 48 stations in 19 sections! -With a Hartley oscillator on 3.5 Mc. and a TNT for 7 and 14 Mc., with input of from 9 to 12 watts, W8FDA, veteran of the low power ranks, made 16,821 points -- 134 stations, 42 sections; tube used was a '71A, and W8FDA says the same B batteries were used in the '35 SS!! -W1EXZ believes in low power -- he ran only 1.75 watts to a 12A7 tube but he worked 14 stations in 7 sections in a few hours of operating, and that is something under present day QRM conditions [see 'Flea Power Association', Chapter 9]. -W9VES with 20 watts input scored 24,048 -- 168 QSO's, 48 sections. -W8LCO hit 4970 points with 16 watts; 52 stations, 31 sections in 17 hours. -12 watts into a '45 TNT on 14 and 3.5 Mc. brought 5301 points to W5FJR (60 stations, 31 sections). -VE4CQ had his fun with 2 watts to a '201-A TNT, working 25 stations in 12 sections. -10 watts brought VE3QB 57 QSO's in 31 sctions, 5058 points.*"

The 1937 'SS' results opened with the note: "Different operators have different ideas of just what constitutes 'low power'. To some, 150 watts seems low, others feel that 75 is about as low as they would care to go, a few think anything above 20 watts is high power. In the 'SS' we find a number of operators using what we consider low power, We think their accomplishments in the contest prove something or other." Battey's idea of low power included but three at 25 watts, as emerged in the listing: "*-VE4CQ ran only 4 watts to a a '201-A TNT, working 60 stations in 35 sections! -And W9VOD, with but 5 to 6 watts input, worked 115 stations in 45 sections!! -Not to be outdone W8OQU worked 41 stations, 26 sections, with a single type '19 at 1 watt input. Now we're really talking low power! -One of our most consistent low power men is W8JA, operating portable in the District of Columbia; he has done some excellent work in O.R.S. Parties and other activities, and in the 'SS' turned in 15,152 points (130 stations, 39 sections) using 6 watts. -You'll have a hard time proving to W9VKF that he needs more than 25 watts because he continues to lead the Southern Minnesota Section with that power -- he made 54,450 this time, working 303 stations in 60 sections. He has a nice DX record, too. -W4COV, also using 25 watts, led the Eastern Florida Section with 28,538 ... 175 stations, 49 sections. -Looking down the list a bit we find W9DBO, 14 watts, with 40 stations, 24 sections. -W8FDA, old-time low-power enthusiast, sticks to his '71A with 10 to 12 watts and worked 177 stations in 55 sections during the contest. -Twelve watts brought W9KMN contacts with 91 stations in*

48 sections. -W8BON's 22 watts worked 82 stations, 32 sections. -W8BXC and W8PIH both used 8 watts input, BXC making 30 contacts in 16 sections, PIH making 70 QSO's in 26 sections." And finally, the complexion of the reports changed in 1939 when the separate low power accomplishments section was dropped. But some QRP results showed up in the summary: "*One of the best low power records of the contest was made by W9FUH, Colorado 'phone winner, who worked 112 stations in 56 sections using not over 33 watts input ... -W9JID, located in a 22ft house trailer at Champlin, Minn., used a single 6L6 oscillator with 10 watts input. He worked 181 stations in 46 sections and totalled 20,585 points.*"

Overall, F.E. Handy (W1BDI) and E.L. Battey (W1UE) emerged as ardent supporters of low power operation during the decade. They were responsible for the attention given QRP in the 'Communications Dept' and 'How's DX?' as well as the 'Sweepstakes Contest' and Field Day reports. The comments about QRP encountered in those sections of *QST* all have the same ring as seen in the above review: both exhibited an enthusiasm for QRP and practical insights which mark them as QRP'rs, at least in spirit! They probably were the moving force behind the two QRP contests cooked up by the *QST* staff in 1932 ('Consistence DX Contest') and 1937 which thrust QRP into the limelight again.

The staff's efforts to encourage low power operation peaked in the announcement in the August, 1937, issue of a new low power contest. This new contest received significant treatment not accorded any other. An entire page set in a bold box was headed in 24pt. type: "**A.R.R.L. Announces August Low Power Contest.**" The announcement itself, written by F.E. Handy (W1BDI), went to great length to define the philosophy and purpose of the contest, and in so doing, bluntly excluded high power stations. It began: "*The purpose behind this activity, as is the case with our June Field Day, is to encourage building and testing of economical self- powered equipment suitable for work in possible future emergencies. Equally important is the conversion of existing stations for continued reliable operation as soon as power fails.*" The contest was aimed at having an immediate impact upon the power demographics of amateur radio: "*The more widespread availability of portables, economical in first cost and operation, but highly practical equipment in this power class, throughout the entire fraternity is the immediate objective.*" Taken thus, these objectives seem to be presented without ulterior motives, but sandwiched between them in the announcement was the revealing Kruse- like point: "*The name of the low power man is legion, and we believe it is time we dedicated an activity to this whole group of operators, with a fair limit that does not invite competition from high-powered stations.*" The contest, in other words, was primarily a QRP contest for the grassroots masquerading behind the guise of emergency preparedness, which, although a stated objective, was compromised significantly in the rules. After having been bluntly 'uninvited', the high power boys were then "*most cordially invited, whatever your present power supply*" providing they ran no more than 25 watts input! The first statement above informed the 'watt-hogs' as to how this was possible -- build a low power rig! The low power men "whose name was legion" *already had* such a transmitter, and needed only to convert to emergency power.

The 'fudging' on the emergency preparedness angle added another twist to the motivation for the contest. Beginning with advice about where to begin, Handy noted: "*The contest set up [i.e., preparation] especially focuses attention on plans for quick conversion of exciter units and receiver power supplies so that existing superlative amateur station equipment can be quickly made self-powered in any time of need, ready for any call to serve the community welfare.*" Again, the only 'exciter units' that could be thus converted were existing QRP transmitters and perhaps the first stages of a QRO transmitter. But in those days, a high power transmitter was really a *big* transmitter! Portability wasn't really essential to the

concept of the contest: "*Emergency power is sometimes required at a home location, so home locations are permissive this time [i.e., this first contest]. Field installations are of course equally welcome.*" The primary mode of operation, in other words, was at the home station, but truly portable set-ups could enter also. Furthermore, emergency power could be eliminated at a small cost: "*Power from commerical mains can be used, but of course will not justify application of the multiplier [x1.5 if either receiver or transmitter was self-powered, x2 if both were] designed to credit the extra effort of expense entailed in setting up self-powered stations.*" Entries were limited to the use of one receiver and one transmitter with one or several operators. What remained after the succession of steps 'fudging' the rules in regard to emergency preparedness was a contest for the typical grassroots operator: one receiver and transmitter, emergency power for either or both if affordable (or not on hand already), otherwise operation from the a.c. mains at home. In other words, a typical grassroots QRP station. The strategy applied by Handy is familiar to anyone who has read the rules for our modern QRP Field Day sponsored by *Milliwatt Books* and the QRP ARCI and that strategy has the same purpose: make it easy for the QRO operator to give QRP a try out -- using the 'big rig' if need be.

Handy closed the announcement with the same kind of enthusiasm which characterises every announcement that ever invited QRO types to give QRP a try. The 'serious' emergency preparedness objectives were part of it: "*Get emergency power now, if you haven't any. This is the opportunity to give a real operating test to the low power rig and see if it and the power supply stand up.*" But that wasn't all. There was a definite lesson to be learned (again!) from the results: "*The whole amateur fraternity is invited to participate with individual stations (25 watts or less) and any power source desired, while finding out just what can be done with this power. A pleasant surprise is in store for some!*" Of course, the low power grassroots would encounter little in the way of surprises about what such a power level could do -- they already knew! Similarly, Handy's final exhortation was not addressed to the grassroots: "*Try the August Low Power Contest at home or afield. It's a brand-new kind of fun.*"

The 'Low Power Contest Results' which appeared in the December, 1937, issue opened with a summary of participation: "*The August Low- Power Contest (for stations using 25 watts or less) turned out to be a miniature Field Day. Some 60 per cent of the 137 operators participating did so from portable stations 'in the field.' 54 operators manned 46 stations at home locations, 83 operators manned 26 field* stations." Handy's use of the numbers may appear an attempt to make participation sound greater than it was. Actually, 72 entrants was an excellent showing in terms of the number of stations. The 1936 Field Day produced entries from 131 stations, although multiple transmitter clubs boosted the actual number of "portable stations" to about 550 "worked or logged" and 642 operators. Depending on how the numbers are compared, the 'Low Power Contest' produced station entries equivalent to 55% of the annual Field Day. The Field Day demographics prove illuminating in regard to the *QST* staff's strategy for the 'Low Power Contest', but more of that later. The predictable 'lesson' followed the summary of participation:

> *Comments from participants bring out the fact that low power gets results. The fellows to whom low power was a new experience, marveled at the results obtained even though the meters were not banging over to the pins. The low power men justly demand, "Chalk up one for our side!"*

Handy, in effect, welcomed 'needle pinner' QRO types who 'marveled' into the QRP fold. The success of the 'Low Power Contest' was couched explicitly in terms of the QRP vs QRO battle that continued through the decade. It was a question of 'sides' and 'winners vs losers', and for a change, the low power men

won one. Handy included a shorter than usual pastiche of 'comments' from participants because "the stories told by those taking part closely parallel the June Field Day experience" given in the November issue. He devoted most of the space to real QRP'rs: "*W9TDR [8 QSO's] used but 2.28 watts, apparently the lowest powered station in the contest. Input at W8IA/3 [15 QSO's] varied between 3.5 and 4.8 watts. Only 3 watts input at W8KO/3 [26 QSO's]. 4 watts input at W1JAH [21 QSO's].*" The lead comment included by Handy affirmed the point of the contest: "*Sure surprised at the good signals most of the low power rigs had. Compared very favorably with 100 and 300 watt rigs. -- W5DYH.*" The contest was intended to demonstrate just that! (*A = B = C, Ergo...*)

The 'Scores' listing included no indication of the actual powers used by entrants and it is impossible to distinguish between the real QRP'rs and those running above 10 watts input. But why quibble over a difference of 15 watts input? Those who ran 25 watts input were close enough to current QRP levels! The list was divided into 'Home Stations' showing 46 entries, 25 of which were powered from a.c. mains, and 'Field Stations' showing 26 entries. For about 30% of the entrants, the 'Low Power Contest' had nothing to do with emergency power. The rules made that possible, despite their emphasis upon that objective. The number of QSO's ranged from a high of 107 down through a minimum of 6, with the following spreads: >90 QSO's: 3 stations; 70-89: 4; 50-69: 7; 30-49: 23, and the remaining stations below 30 QSO's. The spread is not unlike that found in the low power section of the modern QRP Field Day.

But that is not the case in regard to the annual Field Day results of the 1930's, which make clearer than ever the ulterior motives underlying the 'Low Power Contest'. When Handy described the latter as a "miniature June Field Day", he meant that literally. The Field Day results in the November, 1937, issue show 95 entries operating exclusively in the 'low power' class of 20 watts and under, 11 entries using both 'low' and 'medium' [*20 to 60 watts*] power, 12 entries using 'medium' power, and a mere 8 entries using a combination of 'high' power [*over 60 watts*] and 'low' or 'medium' powers. Handy's 'numbers game' makes it impossible to determine the *actual number* of transmitters involved in each group, and the list of scores does not include this information, so we are left with nothing more than the entries totals. Evenso, it is clear that Field Day was a '*big* Low Power Contest' with the overwhelming majority of entries in the low power category. It is hardly necessary to point out the phenomenal contrast with the modern Field Day 'results'! These facts add more clarity to Handy's motive behind the pointed, blunt exclusion of 'watt-hogs' from the 'Low Power Contest': the exclusion involved about a quarter of the entrants in Field Day. Why bother? Similarly, the write-ups for Field Day sounded the same themes as found in the announcement and write-ups for the 'Low Power Contest':

> *"Interest in portable work and the emergency preparedness that it encourages is increasing by leaps and bounds ... Once bitten by the 'portable' bug and once experiencing the surprising work that can be done with low power rigs 'in the field' there is nothing to do but come back for more -- and how the gang comes back each time a Field Day is announced! ... Tests of such new low power stations give a thrill of pride in satisfactory accomplishment that is something above and beyond the usual records so easily possible with plenty of power..."*

In effect, Handy appears to have been deliberately penalizing the 'watt hogs' to make a point about high power, and in the process win a few converts to the low power ranks. It was a bold move, but it seems to have backfired, as we'll see in Chapter 9.

The Field Day reports reflected the preponderence of 'low power' entries. For 1937, The Egyptian Radio Club, W9AIU, topped the field with twelve operators, five 'low power' transmitters, and 204 QSO's from a 200ft bluff overlooking the

Mississippi. W6MVK/W6OFD came in second with 165 QSO's from a 6L6 c.w. rig "with not over 20 watts input" and a 'phone rig at 30 watts. Five transmitters with a maximum input of 18 watts accounted for W3QV's third place showing of 156 QSO's. Four 20-watt transmitters at W2DUA accounted for 154 QSO's and fourth place. Many of the excerpted comments from entrants noted low power: *"We used a 53, 802 rig running 8 watts input on 'phone and 15 watts on c.w. Power was from an a.c. generator run from the car fan belt. And what a gas bill! We were located on Saddle Peak Road up in the Malibu Mtns. -- W6KSX, W6NSC, W6OKL."* And so on. Field Day was a *'big* Low Power Contest' and the excerpted comments read like modern QRP Field Day reports.

The conquest of 10 meter WAC gave special prominence to QRP, since it was first accomplished by a QRP'r, W3FAR. The up-front story "28-Mc WAC Accomplished" in the December, 1935, issue began: "October, 1935, will go down in amateur history as a month of unprecedented activity and unusually good DX conditions on ten meters. All the familiar DX calls were there -- and often with louder signals than they ever put across on 14 mc." The number of operators with 10 meter rigs had grown during the early 1930's, and the upswing in Cycle 17 increased the *R12 Smoothed Sunspot Number* from a miserable 6 at the beginning of 1934 to 51 by October, 1935, still a fairly poor level for 10 meter DX. At the time, only two U.S. stations had succeeded with the 10 meter WAC. John J. Michaels (W3FAR), the first, was described as "a real old timer, having got on the air back in 1912 under the call *9MC* in Chicago." The antenna used by W3FAR in the QRP WAC feat was an 80- meter Zepp up 30ft with 33ft feeders. His work "was done with a pair of '10's in push-pull, using an input of only 22 watts. Five of the six continents were worked on 'phone and well as c.w., using a pair of '46's as Class-B modulators." Handy noted about the accomplishment: *"The ten-meter band thus lives up to its reputation of giving real DX with low* power." To the modern QRP'r who is familiar with QRP WAC's done in an afternoon these days, it is difficult to imagine that WAC was viewed as a challenge throughout the decade even for QRO operators. When a QRP'r turned the trick, it was something of a news item. Thus, W5EZA received double mention in the July, 1936, issue; first, in 'How's DX?' -- *"W5EZA, with 8 watts to a single '12A, has WAC'd twice; among the good ones he has worked are found ZT6X, FB8C, SI1SG, J2LW, J3FI, VK6SA and K7NA"*; and in 'I.A.R.U. News' conducted by Byron H. Goodman -- *"In these days of super-powered ether-busters, we like to meet fellows like D.C. Blake, W5EZA. In sending in his cards for WAC, he mentions the fact that his transmitter is an e.c. '36 oscillator driving a '12A final, input 8 watts! What price high power?"*

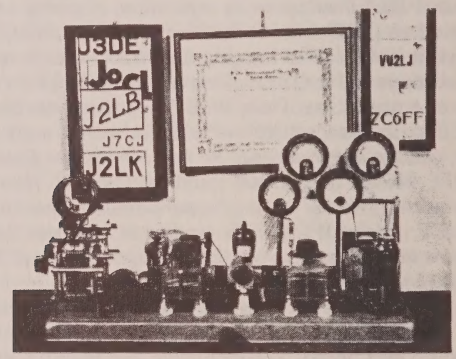
W3FAR once again gained publicity for QRP by winning the 1936 'A.R.R.L. 28-Mc. Contest', a unique type of contest in which scoring was weighted as follows: (1) 50% from QSO points; (2) 25% from the research and development work reported to the ARRL; and (3), 25% from the weekly conditions reported to the ARRL. The contest ran the entire year, with W3FAR averaging 38.6 QSO's per month and submitting the maximum of 25 reports in each category. This was a real 'exploration and discovery' contest involving real work! F.E. Handy mentioned that "W3FAR's 45-page log is a valuable treatise on 28-Mc. communication", and gave an interesting summary: "Scoring points dropped from 1820 in January [*R12 SS Nr: 59*] to but 30 in June [*R12 SS Nr: 77*], rising to more than 1100 per month for September, October and November [*R12 SS Nr:* 90-96], with the record of 2619 points for December, 1936 [*R12 SS Nr: 101*]." He continued with a summary of W3FAR's antenna tests. In opening "W3FAR Wins 28-Mc. Contest", Handey was up to his usual form with a plug for QRP: *"The power input at his station was kept under 50 watts during the entire 12 months, and during March 1936 was kept at 5 watts with results comparable to those at any other*

time, showing the predominating influence of transmission conditions (rather than power levels) in determining successful communication at 28 Mc." [A = B = C again!]

Given the *QST* staff's commitment to proving that 'low power can get results', it is not surprising that just about the only genuine QRP station featured in the 'Amateur Radio Stations' section during the decade appeared at this time. A photo and description of W8ACY, the station of Bruce Kelley of Rochester, NY, in the July, 1936, issue revealed the remarkable achievement of this early QRP'r:

Frequent changes in location since 1929 have caused the transmitter to be developed into a semi-portable affair. Bruce Kelley, the owner, has only one object in amateur radio -- low power 14-mc. DX. Considering the fact that the station is set up in a new location on the average of every six months, quite remarkable work has been accomplished. The original transmitter consisted of a single 45 in a series-fed Hartley with approximately three watts output. All continents except Asia were contacted with this layout. In 1935 a more modern transmitter was constructed using a 59 Tri-tet oscillator, 46 doubler, and a single 210 final with an output in the vicinity of 10 watts. A single wire about 100ft long, without feeded, is directly coupled to the tank through a Collins network. Two power supplies are used, each with an 83 tube. Occasionally grid-bias modulation is used for 'phone work. The receiver has always been the DX'ers standby type, consisting of a 24 detector and a 2A5 audio. With this transmitter WAC has been made innumerable times and the operator is looking for the 70th country. Besides low power DX, considerable interest is shown in photo collecting. Photos have been swapped with stations on all continents. A similar transmitter under the call W2ICE is also used at another station. This station is also WAC.

Featured QRP Station W8ACY.



Directly opposite the photo of W8ACY is a photo of the typical featured station: an operating table with receiver and mike at left, right wall obscured by two complete transmitters, each housed in a 3ft x 6ft cabinet, each with a pair of 212-D's 'normally operated at about 500 or 600 watts input'. The contrast is phenomenal. And another historian's fantasy: discovering W8ACY's logs and photo collection! Bear in mind that WAC was still difficult, and 70 countries was better than average.

The 80-watt QRO station of A. David Middleton, W9WFV, W4CA/5 and W7ZC was featured in the March, 1937, issue, and was the unit left in Rifle, Colorado, during the "Perfect Summer Plus QRPp" (see Chapter 8). The write-up provided biographical details about 'Mid':

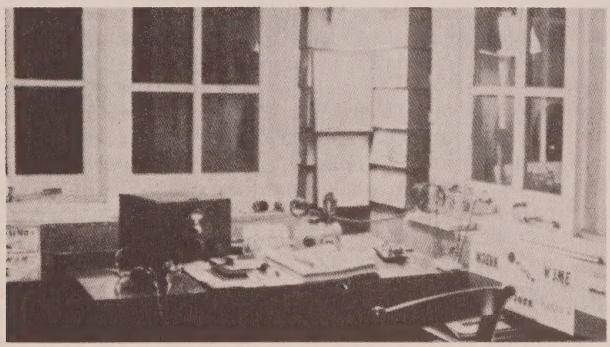
In the two and a half years the rig shown in the photographs has been in existence, some 4000 QSO's have been made [on 80, 40 and 20 meters]. The station

is both WAS and WAC. During nine months spent in various New Mexico locations, W4CA/5 provided a much-needed contact in this state for hundreds of WAS-seeking hams. Much of the recent operation has been carried on at Nederland, Colorado, at an elevation of 8400ft, but a permanent location and the W9 call are now at Rifle Colorado. "Mid" has been in the game since the early '20's, having started out in Indianapolis in the spark days with the w.k. Ford coil. First call was 9BJL, held until 1925 when the QRA was changed to Ohio, when 8CGI, 8AKA, and 8UC came into existence; then in Florida with W4CA and finally in the west with W9WFV. Chief Radio Man in the USNCR and holding appointments as OBS [Official Bulletin Station] and ORS [Official Relay Station], "Mid" is also a writer of fiction on radio subjects, some of his stories having appeared in QST.

A second QRP station photo appeared in 'Ham Shacks' in the April, 1940, issue. By this time, it appears that the *QST* staff had suppressed its fervor regarding QRP accomplishments, and the description of W3EIM was in entirely dispassionate terms:

John Cann, W3EIM, is a newcomer to the ranks of ham radio. Nevertheless, since receiving his license less than a year ago, he has done quite well for himself with his low power rig. He has worked 43 states with confirmations from 41 as well as CM, K4 and K6. The station is located in a convenient corner of the sun parlor. The transmitter is the "QSL 40", described in QST *with a single 6L6G. It is link-coupled to the antenna tuner near the window at the right. The antenna is a 66-foot end-fed Zepp. The receiver is the SW-3 with Brush 'phones. Only two operating frequencies are used at the present time -- 3717 and 7185, the former being used most of the time. John is planning to build a new all-band rig soon with a 200-watt final.*

Featured QRP Station W3EIM.



Gone were the reminders of what low power could do, even though W3EIM's record invited such a comment. And then the final line ... *'bigger and better'*!

III. Flea Power Transmitters and the Thrills of QRP

"...power alone does not mean operating satisfaction;
there is a much greater thrill in having some fellow ham
call you a liar when you tell him your input is only a watt or two..."

Throughout the 1930's, articles describing low power transmitters provided prominent publicity to QRP exploits. Interest in such equipment was sufficient to merit a separate 'Transmitters -- Low Power and Portable' section in the annual index in *QST*. These articles stressed the portability of QRP equipment, their alleviation of QRO QRM, as well as the thrill of QRP operation.

Low power transmitter circuits were included in the 'For the Experimenter' [replaced by 'Hints and Kinks for the Experimenter' in 1936] section of *QST* as possible solutions to the QRO QRM problem. Two circuits suggested by Leonard Tulauskas (W9LKV) appeared in "A 'Fly-Power' 'Phone Transmitter Using a 6A7" in the December, 1935, issue, and made the point. The crystal oscillator circuits used a 6A7 receiving tube operated in either fundamental or harmonic mode with screen-grid modulation directly from a carbon microphone. Grammer reported the results: "*These circuits have been used very successfully for short distance work on the 160-meter band, using an input of less than three watts to the tube. They should be of interest to the amateur who wants an inexpensive low power rig for local work or portable use.*" In a later issue, W9LKV offered several more hints about the 6A7 transmitter "in response to numerous letters and requests for more info". Apparently the 6A7 unit was popular with *QST* readers.

The W9EHC/W5JJ 12A7 Flea Power Transmitter Circuit.

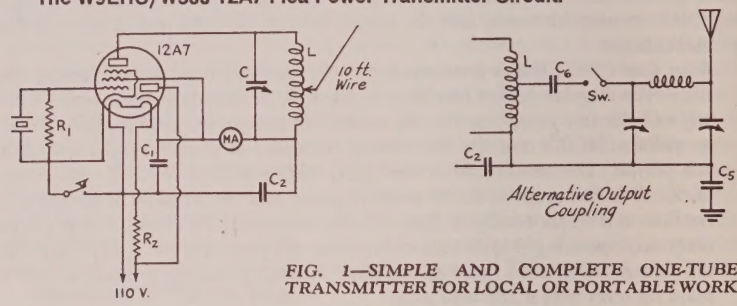


FIG. 1—SIMPLE AND COMPLETE ONE-TUBE TRANSMITTER FOR LOCAL OR PORTABLE WORK

In a similar item, long-time QRP veteran Carl C. Drumeller, then- W9EHC, who contributed several articles to *The Milliwatt* a quarter century later as W5JJ, described a circuit using the dual section rectifier-pentode 12A7 in "A Simple and Inexpensive QRP Transmitter" in the July, 1936, issue. Drumeller began on the QRO QRM theme: "*We all realize that a large part of the QRM on the amateur bands is caused by the use of high-power for local and other short distance* communication." The economics of QRP figured prominently in Drumeller's comments: "*The average amateur, however, is not financially able to put more than a few dollars into an auxiliary transmitter; he always needs every dollar he can spare for improvements on his main rig. There is one way, however, in which a very inexpensive low power set suitable for short distance communication can be built in a few minutes' time. It requires no additional power supply; only the key, crystal and antenna from the main transmitter.*" The half-wave rectifier section of the 12A7 hooked directly into the 115-volt a.c. mains provided filtered d.c. voltage to the pentode crystal oscillator transmitter section of the 12A7. The 'results' comment evoked the satisfaction of operating genuine QRP: "*I have built two such transmitters, using the circuits in Fig. 1, and have had very pleasing results with them. Using the simpler antenna system [a 10ft wire tapped directly onto the plate inductance], I contacted a station 407 miles away and received an RST349X report.*" The frequency was not specified, but the distance is excellent for a 10ft wire at any frequency! Drumeller's precise definition of the mileage involved reflects the true QRP'rs concern with precision in defining achievements -- not merely 400 miles, but *407* miles! A big difference! His comment about the method of initiating contact seems directed at the operators who had a QRO transmitter: "*This was done merely by answering his CQ, not by the usual method of contacting a station on high power and then shifting the crystal to the flea powered transmitter.*" Of course, low power operators did not have a QRO rig in the first place; W9EHC was thus pointing out that contact actually could be initiated with a flea

power transmitter and was inviting QRO types who were trying out QRP to go the whole way.

Drumeller's description of his flea power transmitter had a more far reaching impact on American amateur radio than he could ever have imagined. On July 8, 1936, a few days after the July *QST* had arrived in the mail, Robert Curtis, W1EXZ/N1EXZ, put his version of the 12A7 rig on the air from Springfield, MA. W1EXZ has graciously provided some documentation of this early part of his QRP work from materials which fortunately survived until 1987! The 'parts list' included:

1-	12A7 tube	$1.32
1-	25,000 resistance	.10
1-	24 mfd. condenser	2.40
1-	350 resistance	.60
2-	ant. clips	.10
3-	stand-off insulators	.25
		$4.77

Curtis comments: "*Not bad. A complete transmitter for less than 5 bucks!*" He recalls about his QRP work: "*In general, the little one-tube rig ran about two watts. On the sheet where I listed my QSOs, I noted down the power for each QSO. Evidently I measured the input power each time.*" At the time, Curtis was in the Naval Reserve and used his N1EXZ call for regular contacts, and kept a "running log on a typewriter" for recording every character received during a QSO. A portion of his log [from July 6, 1936, to August 7, 1936] has survived and provides an intimate view of the QRP'rs on the air experience in 1936.

Firing up on 3600 kHz on July 8 at 1833 local time, W1EXZ called *CQ* once, called W1DLX, then *CQ* twice before switching to the QRO transmitter [*pair of* '45's] and working W1JRW at 1901. July 11 saw similar results: two *CQ*'s and an unsuccessful call to W1GAE from 0634-0646. A QRP and then a QRO *CQ* were unsuccessful at 1600-1607, as well as three unsuccessful QRO calls at 2105-2124. On July 12, three unsuccessful QRO *CQ*'s and two calls to W1BOE from 0518-0545. Back on the air with the 12A7 at 1144 first with a *CQ* and then a call to W1JHY, and finally, the first successful QRP QSO at 1150 with W1AFG (running 30 watts) who gave W1EXZ an RST 339 report in "lousy conditions". The W1AFG QSL listed the report as 339x-449x and remarked: "*Tnx qsl es fb on ur flea pwr, Bob*". It is obvious from the log that the QRP 'bug' bit: the QRO rig stood idle except for one QSO. W1EXZ fired up at 1823 on July 13, with three *CQ*'s and calls to W1JNN and W1IYB, and then at 1920 worked W1JGB in Providence, RI, who gave him an RST 579x and responded to W1EXZ's transmission: "*r r solid om fb. tnx for fb dope abt ur rig hi fb vy gud sig in hr om weak but vy gud steady note fb. gess u will hav mani more qso s wid that little rig hi*". Firing up at 1819 on July 15, W1EXZ called *CQ* and then at 1827 worked W1CME in Manchester, NH, who gave an RST 489x report, and commented: "*sure fb vy on low pwr ob ['old boy']. hrd abt ur 12A7 rig es wondered wat it wud do. ur sure doin fb wid it. are u planning to use it portable*". After the W1CME QSO, at 1859 W1EXZ called W2JDD, W1JPF, W1JDS, and got a QRZ from W1JDS on the second call, but no luck, and then a final call to W1HJR at 1929. On July 16, W1EXZ called W2JDY, W1AJD (twice), *CQ*, VE2HI and W2JUX, and after 19 minutes of failure, finally worked W2ITX in Stony Brook, L.I., with a 369x report. The QSO was devoted to passing one message to W1EXZ for delivery to West Hartford, CT. July 17 saw three unsuccessful QRP calls to W1HKY, W1BOE and W2IIA at 1928. July 19 was limited to one QRO QSO and a message. July 20 was a bad day, with nine unsuccessful calls. Not much better on July 22, with five calls and a QRZ from W1HRN. But things improved on July 25, beginning with a call to W1JXU at 1550, followed by a contact with

W2GIC at Northport, L.I. at 1611 and a 579x report. W2GIC commented: "*ok on ur flea pwr ob and a vy nice sig ob*". The W2GIC QSO was followed by two calls (1637- 1642), and at 1720 W1EXZ worked W1ISM in N. Abington, MA, with a 569x report but with QRM: "*most. u are abt r3 r3 hr now. sum qrm but not bd*". July 26 began with three unsuccessful calls at 0552-0558, then at 1108 calls to W1IOR (two), W1IHW, W1EOB, *W1UE* [*E.L. Battey*], W1BVR, one *CQ*, and then a contact with W1IEX at 1142 who gave the report: "*ur sig is very weak rst rst 449 hr in providence ri.*" August 2 produced no results with five calls at 0840-0856, and three calls at 1240-1254 finally raised W1IDB who lost W1EXZ on his first transmission. August 6 was a good day: the first call at 1855 resulted in contact with W1HWZ in Brookline, MA, who reported RST 579 and complained: "*glad to contact u om. is been cm my head off hr gess hv to increas power hr.*" And finally, six calls on August 7 produced no results. W1EXZ kept a separate list of his QRP contacts:

W1EXZ QRP QSO's: *July 8 -September 7, 1936*

N1AFG	339x	Goodyear, Conn.	1.95w	7/22/36	41mi
W1JGB	579x	E. Providemce, R.I.	2.025w	7/23/36	65mi
W1CME	489x	Manchester, N.H.	2.025w	7/25/36	79mi
W2ITX	369x	Stony Brook, L.I.	2.025w	7/26/36	90mi
W2GIC	579x	North Port, L.I.	2.025w	7/35/36	87mi
W1ISM	569x	Abington, Mass.	2.025w	7/35/36	78mi
W1IEX	449x	Providence, R.I.	2.025w	7/36/36	64mi
N1HWZ	579	Brookline, Mass.	1.78w	8/7/36	71mi
N1QW	459x	Newburyport, Mass.	1.68w	9/7/36	104mi

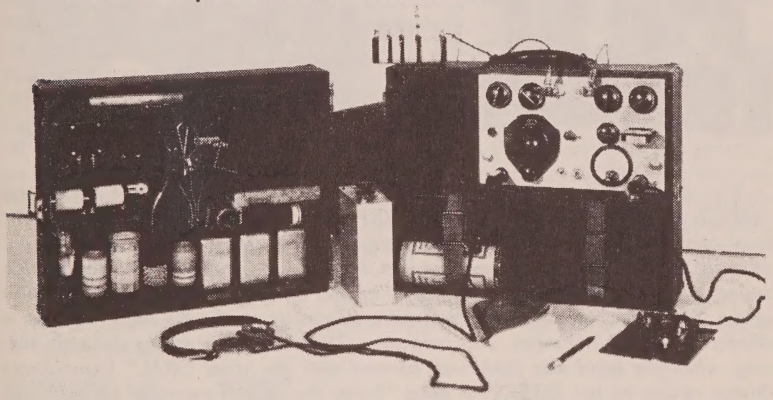
Judging from W1EXZ's log, contacts were fairly difficult to make during summer 80 meter conditions. Bear in mind that W1EXZ had but a single crystal on 3600 kHz. Curtis remarks that there weren't many 'flea power' stations around his area in 1936. Perhaps that is why word had reached W1CME about W1EXZ's rig. His success with the W5JJ 12A7 transmitter led to the idea of forming the 'Flea Power Association.' Like W5JJ, W1EXZ would also be among contributors to *The Milliwatt* many years later.

In the June, 1934, issue, portability was stressed as Philip Rosenblatt (W2AKF) and Henry T. Miller (W2AIS) described "The Ultra-Midget: A 10-watt Transmitter of Miniature Dimensions": "*Another midget? Yes! And truly a Lilliputian in comparison to most. When an iron shield-can measuring 5 by 5 by 6 inches can house a push-pull Hartley oscillator [using a pair of Type '45s] plus a 225-volt, well-filtered power supply, pretty nearly the ultimate in smallness for a practical transmitter has been achieved. Carry it around in a small week-end bag, complete. Plug into a 115-volt a.c. supply [a.c. mains], attach the antenna, insert the key and tubes and settle down to the best time you ever had with low power.*" The entire transmitter drew 32 watts, of which 11.25 watts were consumed in the plate circuit. The drama of operating QRP began when this '*ether buster*' (as W2AKF fondly referred to it) was hooked up: "*Rather skeptically the tiny mite was put on the air at W2AIS. A CQ by W2DXT was answered. He gave us a pure d.c., QSA5, R8. Another CQ from W2EPZ was attended to, and he came right back, giving a d.c. report, QSA5, R7/8. Contact with W2EPZ held for a half hour, during which no changes were made on the transmitter. This lengthy contact was to determine the stability of the oscillator. W2EPZ gave us the encouraging report of a steady signal, no creeping.*" With the tubes mounted externally on the chassis box, the circuit, an oscillator coupled directly to the antenna, proved thermally stable. With this test completed, the authors continued: "*Becoming a bit more bold, W9GPZ was called. Right back he came, giving the millimite a pure d.c. QSA3, R4/6, and very steady note. The final contact of the evening was W5HG. Enough to cherry the plates of the 45's with conceit, he gave them pure d.c., QSA4, R7! The*

above contacts were made on the 40-meter band, between 9 and 11 p.m. Oscillation was steady and strong over the entire band. On the 20-meter band, only the frequency and stability were checked. FB all around." The pride experienced by the successful QRP homebrewer is obvious.

The frequent comments by Handy and Battey about the need for emergency preparedness apparently inspired E.S. Van Duesen (W3ECP) to implement their goals in "A Complete Battery Operated Portable Station" in *QST* for July, 1935. W3ECP's unit differed from those featured in previous articles about 'portables' in that it was a complete station in one box: a "salvaged case from a defunct portable phonograph" in this instance. A second version appeared in "A Complete Dry-Battery Portable Station with Crystal Controlled Transmitter" in the June, 1937, issue and looked forward to the modern QRP portable: everything including batteries, key, 'phones, antenna, 'midget monitor', ground rod, spare tube, complete set of plug-in coils for 160, 80, 40 and 20 meters, and tools, carried in a single case. One minor difference: W3ECP's unit weighed *'only* about 32 pounds'!

***W3ECP*'s Complete 1-Watt Portable Station.**

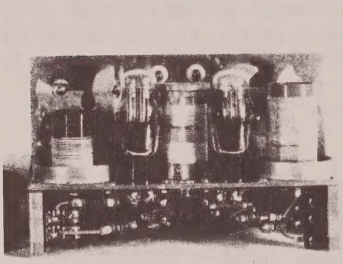


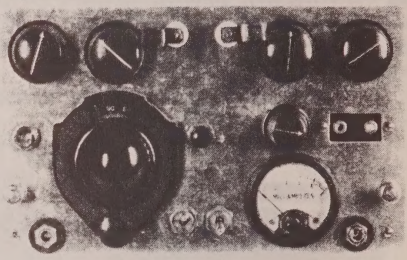
The simple circuit employed a dual section '19 tube as a regenerative detector and audio amplifier, and another as crystal oscillator and amplifier stages. Despite the overall size, the actual electronics were quite small. The original version used a modified Hartley oscillator at 1 watt input, but "*despite this low power input, the set was used successfully on various occasions for consistent communication over moderate distances. For a period of several months during the winter of 1936-1936, when the writer was fortunate enough to be a patient at Walter Reed Hospital, Washington, D.C., and closely confined to his bed, the little set served exceedingly well in providing both a welcome diversion from the monotony of hospital routine and a means of contact with friends and relatives. The most successful operation with the first model was accomplished during the summer of 1936, when the equipment was taken along on a vacation trip to Otsego Lake, in central New York State, and consistently maintained schedules with stations in central New Jersey during the period of peak summer QRN.*"

The major difficulty with that unit, frequency instability, led to the switch to crystal control and a resulting input of 2 watts. W3ECP's 'results' reveal the 'odds' facing QRP'rs: "*Of course, the little rig cannot compete with the QRM usually present on the amateur bands during the evening traffic hours, but for emergency or auxiliary purposes it has a really respectable 'sock' and the signal is read very easily through normal interference, due largely to the perfectly clean note resulting from the use of battery power. Consistent communication on the 80-meter band*

has been accomplished during the past winter [R12 S.S. Nr: 58-62] with stations in all W districts east of the Mississippi, and with all states in those districts except Wisconsin, Mississippi, Alabama and Florida, both from the home station location in Baltimore, and from various field operating positions. On 40 meters, contact has been established with stations in mid-west W9 and in W5 districts. The home station antenna is a 45-foot wire, loaded to operate as a Marconi radiator, while the field antenna usually is a 66-foot piece of bell-wire drawn up on any convenient tree limb or pole. An alternate antenna which has been used successfully is a Hertz arrangement with two 33-foot sections, center-fed, but the best results to date have been with the Marconi type of antenna." Apparently W3ECP was a real QRP'r who liked field operation!

Views of W3ECP's 1-Watt Transmitter & Receiver.





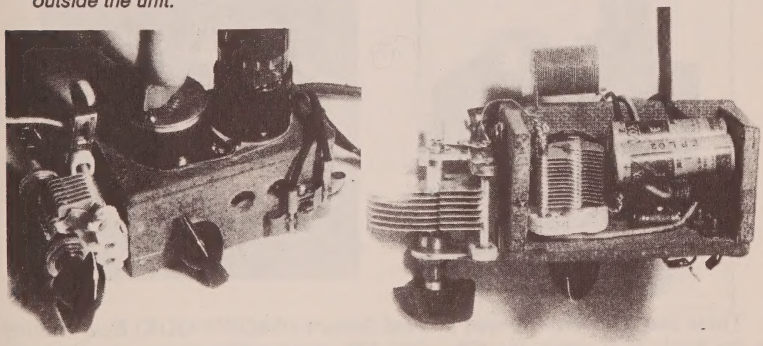
The description of the rig naturally turned to the QRO QRM issue, and W3ECP provided evidence from real QRP tests to make the usual point: "*For local operation and the reduction of neighborhood QRM, the results obtained are most satisfactory. On at least one occasion during preliminary tests with this set, the power input was reduced to less than one-quarter of a watt to the amplifier section of the '19, yet maintaining solid readability of signals on the 80- meter band at a distance of about 250 miles. This particular QSO took place during the early evening, when the band was fairly well covered with the usual QRM.*" Experiences during operation led W3ECP to note: "*From the interest expressed by operators who have heard and worked this little 'peanut whistler' on the air, it is believed that there is a real field for the application of similar equipment.*" And finally, after the cool account of successes, the QRP'r in W3ECP emerged in his concluding comments: "*After all, power alone does not mean operating satisfaction; there is a much greater thrill in having some fellow ham call you a liar when you tell him your input is only a watt or two, than there is in the disappointment you feel when a VK or ZL reports your 'California Kilowatt' only RST 479!*"

Size was diminished with each of the series of 'midget' transmitter articles that followed. In the June, 1936, issue, Frank Edmonds (W2DIY) employed the new 6L6G in a crystal oscillator exciter unit. Fred Sutter (W8QBW-W8QDK) began his description of "The 'QSL 40': A Compact and Inexpensive 3.5- and 7-Mc. Transmitter" (February, 1938) by finding W2DIY's "*way of thinking highly inspirational. In fact, it is even more than inspirational; it fairly stampedes one into action. At any rate, it stampeded me, and there resulted here at W8QBW rig after rig using 6L6 and 6L6G tubes, Tri-tet, mongrel and straight circuits with all kinds of values and coils.*" A well-written piece about a QRP rig has had the same effect on countless operators over the years. Ironically, the W2DIY article was not about QRP but about the ability of the new 6L6 as a crystal oscillator to drive a final amplifier to 200 watts input! Nonetheless, W2DIY began Sutter's long love affair with the 6L6 which produced a classic series of construction articles. In this case, the typical experimentation with circuits and the like eventually led to the

ultimate QRP rig: "*And Came the Dawn! A tiny transmitter using the 6L6G tube, straight circuit, on a wee chassis 3-1/2 by 5-1/2 inches, which would light a 40-watt G.E. Mazda dummy load to more than full brilliancy.*" Then the final challenge -- a suitable title for the creation: "Now if you measure your QSL card and find that it is 3-1/2 by 5-1/2 inches you will see why this one was christened the 'QSL 40'."

W8QBW initially worked up the transmitter to employ along the line suggested by W2DIY: as an exciter driving a 200-watt amplifier. But, "*when I found out how this little fellow went to town both here at W8QBW and at W8QDK the big tube idea faded down to about S- 1/2 and the 2000-volt transformer went on the shelf and is still there. R.I.P.*" A QRP convert in the days when they had to build their KW's, but the same end result -- QRO to the shelves, QRP to the operating table! The results which led to W8QBW's enthusiasm: "*On 40 meters the rig has worked all W districts from this QTH, which is in Grosse Pointe, Mich., along the shore of Lake St. Clair. A report of S7 is unusual, S8 and S9 being rather the rule. The poorest report so far is S4 from W7GAF in Stanfield, Oregon, about 1775 miles, and the next poorest is S5 from W6KBZ, Rena, Nevada, about 1950 miles. When W8QDK went on the air for the first time in July, 1937, the first 29 CQ's resulted in 24 QSO's, on 40 meters, all during daylight hours. Surely no reasonably minded ham can demand more from a $1.35 bottle [tube].*" W8QBW closed with comments about operating techniques including selecting a clear frequency for calling CQ and answering the other fellow's CQ. While the 'QSL 40' was described as a 40 watt rig, the cost of a power supply to achieve that power level was probably an incentive to newcomers to use the rig at lower power levels. The output power claimed by W8QBW also must be derated considerably. Sutter would eventually convert to real QRP in a later rig ('The Portable Five' described below), but the size of that unit would be bettered in the final installment of 'flea power' rigs before the War.

W9ZGD's **'A Pocketful of Watts' Transmitter.** *The components overflowed the original masonite chassis so that the plate coil and tuning capacitor mount outside the unit.*

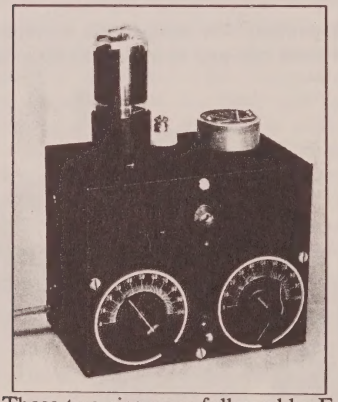


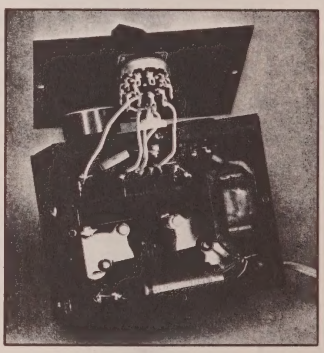
The January, 1941, issue of *QSR* featured two mini-rigs which employed the newly introduced dual section 117L7GT consisting of a beam-power amplifier and half-wave rectifier combination which would continue to be popular among QRP'rs until the 1960's. The article included the boxed header: "*If high powered operation has begun to pall and you're looking for some new fun, or if you're simply interested in gadgety little transmitters, you can get plenty of ideas from the two simple transmitters described here*". Keith Hayes' (W9ZGD) "A Pocketfull of Watts" rig captures the prize for pre-transistor miniaturization at 5 watts input. W9ZGD begged off citing results and instead used the 'S' unit [*i.e., signal*

strength, 1-9 scale] argument: "*Although 4 or 5 watts doesn't sound like much input it is surprising what one of these little transmitters will do, particularly to one who has never tried anything like it before. Possibly, according to tradition, I should list the stations worked but, since the antenna, receiver and operating ability affect the statistics as much as transmitting power, I'll just mention the fact that 5 watts give a signal about one 'S' point lower than 20 watts and 2 'S' points lower than 80 watts. Anyway, it's more fun to fish with barbless hooks!*"

In contrast, R.T. Lawrence (W8LCO) was more enthusiastic in describing his "Pee-Wee Transmitter" which came into existence thus: "*This is the old story told once again. I had been rebuilding the big rig and, getting tired of being off the air, I threw together a little rig to play with. Result: there hasn't been much work done on the big rig!*" In remarking on his results, Lawrence gave the hint: "*Operation with a low powered rig like this holds a lot of thrills. The main point to remember is that QRP requires 'riding the skip'; that is, working stations at the distance that is optimum for any particular time.*" The results themselves were impressive: "*Using a 66-foot end-fed wire for the antenna, I have managed to run up a score of 29 states on 40 and 80 meters in slightly over a month's operation [R12 S.S. Nr: 60-67]. Working in the Sweepstakes Contest, where no one will deny the competition is tough most of the time, 41 stations were worked in 17 sections. Prior to the SS Contest, the best DX was Colorado, but a 7-Mc. contact during the Contest with W6IDZ broke that record and handed me a thrill that it will take a long time to forget. No doubt 'charity begins in contests,' and the average signal report of S6 may be only an indication of good humor and tolerance on the part of the stations worked, but the contacts are there in the log and that's what really counts.*"

W8LCO's 'Pee-Wee Transmitter'. *This version of the 117L7GT circuit employed a multi-tap pi-network antenna coupling circuit with a five-position switch mounted on the rear panel.*





These two rigs were followed by Fred Sutter's (W8QBW-QDK) final offering in the April, 1941, issue, the "The QSL-25", another 6L6 transmitter, but built onto a baking pan with power supply included. The article was prefaced with the sad note about Sutter's death on February 23: "*We find it difficult to associate the idea of death with Fred Sutter. The youthfulness of his outlook was in no way dimmed by his seventy-odd years; no better testimony of this is to be found than in his QST descriptions of the post-card sized transmitters it was his delight to devise. We knew him, through correspondence, for several years without suspecting that he was not so young in years as in spirit. His writings were motivated by a desire to be helpful to the younger generation, particularly those whose resources were limited. There is no better expression of the true amateur spirit.*" The Editor offered this

final article as W8QBW's 'epitaph': "*If anything so exuberantly cheerful can serve as an epitaph, let it so stand. Vale* W8QBW." In the article, Sutter noted that *"there must be literally hundreds of these various 'QSL' rigs in use" and the only problems resulted from changes in the original designs. Evenso, "Make all the changes you want to, of course -- have a good time! But don't throw any pop-bottles at the umpire [i.e., the designer]. " Aside from the discussion of the circuit, Sutter stressed the major point leading to success with QRP: "I suggest to the builder of this or any other rig, that he start at the antenna. Most any amateur will tell you that a few watts in a top-notch antenna are better than ten times that power in a haywire sky hook.*" It seems particularly appropriate that Sutter ended his career of inspiring newcomers on this note.

Chapter 8
1930's: The QRPr's Story

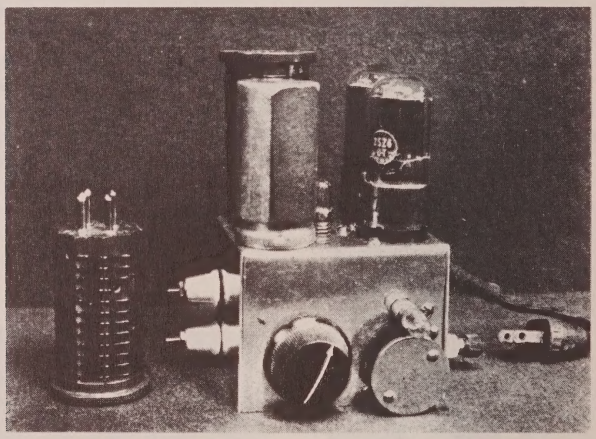
In Their Own Words: The QRP Story

"...there may be another kind of surprise when the story is read..."

Throughout the decade, the story of the challenge and thrill of QRP operation was told by QRP'rs themselves. Their accounts appeared in various contexts, and several are worth reproducing at length. Modern QRP'rs will find themselves in familiar company in reading the accounts included here, beginning with Fred Sutter's conversion and his enthusiastic sharing of that experience.

I. Sutter's Conversion - 'The Portable Five'

Sutter's 'The Portable Five'. *Chassis box was formed from a single piece of aluminum stock. Plug-in coils permit band switching. White posts at left are antenna output, and crystal is to right of knob.*



Sutter repented of his courtship of high power QRP in his discussion of "The 'Portable Five': A Midget Transmitter with 5 Watts Output" in the December, 1939 issue and emerged as a genuine QRP'r: *"This story may surprise or even disappoint those who have followed the adventures of our little hero, the 6L6G tube whom we left in the September issue putting out sixty watts [i.e., in the 'Runt Sixty' and 'QSL Sixty' versions of the 'QSL 40']. It is, perhaps, anti-climax to describe now a midget transmitter with five watts output, but there may be another kind of surprise when the story is read."* In the intervening time since the 'QSL 40', W2GCV, then W9IGF, and finally Sutter himself expanded on that rig. Higher power with the 6L6 was the common objective. 'The Portable Five' was the next in the series: *"And now along comes ole 8QBW painting the lily (to coin a phrase). All that I can offer is that this adaptation is very small, very light and very will enclosed against mechanical derangement, so that it is really a portable transmitter."* Sutter's humour turned to the use of that term to describe the previous rigs: *"That word 'portable' has been much overworked, definitely. If you do your 'porting' in a truck or an automobile, then a lawn-mower or a St. Bernard are portable, I suppose."* On

the other hand, the 'Portable Five' was different: *"the whole works, transmitter and power supply, on a chassis only 3 by 3-1/2 by 2-3/4 inches, and the weight is one pound and ten ounces. The output is a little better than five watts. The cost, exclusive of crystal, is $6.43. It can be tucked into a corner of the suitcase without taking up room or adding weight to amount to anything."* The circuit used a 25Z6GT in a rectifier circuit connected to the a.c. mains, and a 25L6GT crystal oscillator, the type of circuit used by Drumeller earlier and by many designers for years thereafter.

'Portable Five' Circuit.

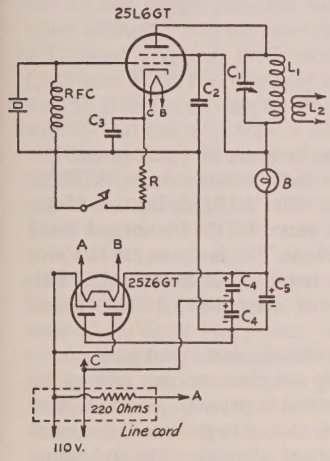


Fig 1 — The "Portable Five" Circuit Diagr am.
C_1 — 100-$\mu\mu$fd. midget variable (Hammarlund MC-100-S).
C_2, C_3 — 0.01-μfd. paper, 600-volt.
C_4-C_4 — Dual-8-μfd. electrolytic (Cornell-Dubilier KR-288).
C_5 — 10-μfd. electrolytic, 300-volt (Mallory type BB).
L_1, L_2 — See text.
R — 200 ohms, 10-watt (Ohmite Brown Devil).
RFC — Receiver-type choke.
B — Pilot bulb, No. 40 tan bead.

In filament circuit, connect similarly-lettered points. Chassis is not connected electrically to any part of the circuit.

NOTE. — The key is not at ground potential in this circuit, and although the voltage between key leads and ground is not dangerous, care should be taken to avoid touching metal parts of the key.

Most of Sutter's article was about the 'surprise story' which amounted to little more than a testimonial by the QRP convert: *"I can already hear a snort from Dan to Denver, 'Who wants to bother with five watts, anyhow?' Well, that is what I thought myself, but you can never tell till you try, so the little job was put on the air and some surprises were immediately uncorked!"* Sutter went on to 'uncork' his QRP results [*R12 Smoothed Sunspot Number at 38*]:

"At W8QDK, on 40 meters, the first 36 tries resulted in 21 QSO's, or 60%. A couple of these were ended by QRM, but this is nothing unusual, so we won't worry. These contacts ranged from Massachusetts, New York, New Jersey, Pennyslvania, Michigan, Ohio, Virginia, Wisconsin and Indiana. They averaged about RST 579x. This was in July, by no means a favorable period. Nine of them were local, *i.e.,* within the state of Michigan. At W8QBW operation was confined to the 80-meter band and the first 33 tries resulted in 21 QSO's or 64%. These ranged from Michigan, Ohio, Illinois, S. Carolina, Pennsylvania, New York and New Jersey. It may as well go into the record that the antennas here are pretty good: 80-meter halfwave Zepps about 40 feet up and well in the clear. It is still true that a dime in the antenna is worth a dollar in the transmitter, and although I won't vouch for the exact accuracy of this formula, there is the idea, anyway. Fortunately a good antenna involves little more outlay than a makeshift wire. Careful planning and 'armstrong' tactics which cost nothing making the difference. Just what this rig will do when the frost is on the pumpkin remains to be seen [*i.e., when conditions improve*]

It will, with suitable crystals, work on 80, 40 and 20 meters. But I would not bother with 20 meters, for those chaps won't pay much attention to W's.

If you have a 20-meter crystal you can give it a whirl, of course, but I would not advise investing in one just for the purpose of using it in the 'Portable Five'. Abner, take notice!

(Note: --That bit of advice was written before war restrictions had clamped down on nearly all DX. At present the DX addicts are forced to fall back on W QSO's or keep still -- and you know a ham just can't keep still. So at present you can indulge in plenty of activity on 20. As an indication of what may be done, at present, here is the log of W8QBW for September 28, 1939 *[R12 SS Nr: 51]* on 20 meters (14,300 kc.) using the 'Portable Five':

1153	**W1LYL**	Boston, MA	569x
1310	**W4MR**	Greensboro, NC	599x
1535	**W4FLP**	Franklin, TN	589x
1804	**W2FHM**	Long Island, NY	589x
2007	**W9QWA**	Hastings, NB	589x
2050	**W5DNW**	Lafayette, LA	589x

On that date there were five failures so the measure of success was 54%. On September 25 and September 26th, the best contacts were W7HFG, Sheridan, Wyo., 569x: W9CJZ, Balaton, Minn., 589x: W1KQZ, Boston, Mass., 579x: and W5BVM, Dallas, Tex., 589x. All of those RST's are correct and I hope the printer gets them as I have written them. This looks to me like nice work for a transmitter with only five watts output. One fellow said, 'This QSO has opened my eyes to the possibilities of low power.' And it opened mine also!)"

Sutter concluded his write-up with advice about efficiency and signal purity:

"You should have some means of judging antenna current, and an indicator costing only a few cents has been described in previous issues. A small rig tuned on the nose may put out more power than a larger one if the latter is inefficiently tuned. In general, tuning consists of adjusting plate and antenna condensers to secure maximum antenna current and minimum plate current. However, to obtain the best *sounding* signal from this or any other transmitter, a monitor is desirable. Frequently the receiver can be used for monitoring, but failing this a monitor such as shown in the *Handbook* can be cheaply assembled."

In spite of its small size and power this transmitter will do surprising work. You can have a lot of fun with amateur radio without working Africa or Australia!"

II. Brief QRP Operating Reports

In addition to QRP stories in featured articles, QRP'rs occasionally wrote to the 'Correspondence' section to report results. Accidental QRP converts are among these, and their experiences usually were tied into the high vs low power and QRM controversy. One such letter is found early on in the August, 1932, issue, from George Morrow, W8BKP, under the heading 'Low Power DX':

"Most of the fellows feel that we must use high power in order to work DX consistently. I was of that opinion myself until lately. A couple of months ago some one broke into my home and stole everything on my transmitter of any value, including the 204-A, a pair of 852's, a pair of 866's, four meters, a couple of crystals, 'phones and a score of African and Asian QSL cards, so I am reduced to using one '210 tube in the final stage with an input of 21 to 40 watts. This power works almost as good for DX as my old sets using up to 250 watts input. I was able to WAC in two nights in January on 7 mc., with an R3 from ZU6W for the worst report and an R6 from ZL2BA for the best. Using 21 watts I have worked ZL's every night for a month, some contacts as early

as 12:30 a.m. E.S.T. -- all this on 7 mc. ... I think if the fellows would only get decent notes and didn't try to get the last ounce of power out of their rigs, they would be able to do all I'm doing with low power."

In the same issue, a rather vociferous Earl V. Fouch (W6CZO-W6DWB) added his two-bits in about the only such letter found in the decade: "Now that that's out of my system, I can blow up on another very important subject, viz., Hi power vs. Lo power. Nell's bells! Can't you fellows find something more important to argue about? Who cares what power the other guy uses? Did any of you fellows ever play football? If so, did you break down and cry because your opponent was bigger than you were? Naw! You used your wits and overcame his brute strength!" *Pity the poor YL's*! John T. Chambers' (W6NLZ) 'What Good's a Kilowatt' (August, 1937) stressed the economics of QRP: "Recently I had a QSO with W7FHW, who said my signals were 'S9 chirpy'. So I took off the 250-watt final and used only the 40-watt buffer. He noticed no difference in strength: still 'S9 and chirpy'. I took it off and used the 25-watt 6L6G doubler. The signal was still a chirpy S9, only slightly weaker." Having laid the facts on the table, W6NLZ then lamented: "Now why should we run a 'California kilowatt' when half the soup brings the same S reports. A power limit of 100 watts would have saved me lost of $$. The only thing I've got against the 100-watt limit is that it would take away one of our rights." In the July, 1936, issue, Louis E. Bundy (W8WQ) slipped his QRP results into his comments on the 'To Call or Not to Call [CQ DX]' controversy: "I would like to express my opinion on 'CQ DX'. My xmtr is decidedly low power, using a '46 final with 16 watts input. All my DX which includes 40 countries has been worked by answering CQ's. In fact, only one DX contact has resulted from me calling 'CQ DX'."

The 'miles per watt' idea encouraged by Handy in the mid-1930's continued to intrigue amateurs for the remainder of the decade. The final 'record' reported in 'Correspondence Dept.' was a good one 'hung up' by Court Matthews (W6EAK) in the May, 1940, issue:

118,000 M.P.W.

"After reading several reports in *QST* during the past year concerning field day tests and the fine results the boys were getting with their low power portables, I was bit by the bug myself. About three weeks ago I built a little portable transmitter. It uses a 6F6 tube in a conventional crystal circuit and normally feeds a 135-foot end-fed antenna. The little gadget is only 6 inches on a side and will almost fit into a coat pocket, but since its inception the big 500-watt rig has hardly been touched ...

An input of 5 watts from a bank of 'B' batteries brings S9 reports from anywhere in California during the day on 7 Mc. [*R12 S.S. Nr: 72*]. At night, with the same input, contacts have been made with East coast W's, Hawaii, Alaska and Japan. Reports at these distances average S4 to S5. It was a fine QSO with W6IJB in San Francisco that awakened me to the possibilities of extremely low power. He reported the 5-watt signal RST559 and suggested reducing power. I started down the battery taps and finally wound up on the last tap of the last battery, with W6IJB still reporting RST559. The input at this time was 22 volts at 2.5 ma. -- about one-twentieth of a watt. I had no way of further reducing power and decided then to be ready for real QRP work in the future. A search in the junk box brought to light a 4.5-volt 'C' battery and two 1.5-volt dry cells. The total output of this combination was 7 volts, and the transmitter would still oscillate drawing one milliampere of plate current -- an input of 0.007 watt. On March 6th, at about 1:00 a.m. P.S.T., I successfully worked W9VZZ in Denver, Colorado, with this input. Starting with an input of 5 watts and an RST589 report, the power was

gradually reduced. At one-twentieth of a watt W9VZZ reported me still easily readable at S3 to S4, so the 7-volt supply was hooked up and a call made. W9VZZ came right back and reported the signal down to S1, but he was still able to identify the test characters sent. Hollywood, California to Denver, Colorado -- 830 miles -- on seven thousandths of a watt! This works out to better than 118,000 miles per watt, and unless somebody else has hung up a better score we are offering it as a record for QRP over this distance. Would somebody make me an offer on a nice 500-watt transmitter?"

A regular QRP'r, D. von Ruysdael Drenner, W7FHZ, submitted "Two Watts Max" (February, 1938) to share his QRP experiences. His letter reads like the many operating reports submitted to *The Milliwatt* during the 1970's! After the modest introduction, "I know, I haven't worked any ZS's or VK's, but I want to tell you a few of the things behind the two watts here at W7FHZ", he wrote:

Two Watts Max

"I operate spasmodically, whenever the 'A' battery will hold up. The darn thing won't take more than half a charge, and even that requires two days of motherly attention to the gasoline motor which runs the old make-unknown generator which gets as hot as an old '10 with 1500v on the plate I used to own. This gas motor really belongs to the washing machine, but I use it every day except Monday, so it's really a part of my power supply. The rig is a 6L6, Tri-tet, working 3570 kc. and 7140 kc. with the same coils: I just short out the cathode coil and re-tune. The antenna is an end-fed Hertz, 133ft long and supported by a 60ft cedar pole, purloined from the hill back of the house. The station is located on a ranch in the Calapooya Mountains, 40 miles SE of Eugene, Oregon. The receiver is a 30 and a 19 two-stage. On 80 the input is 1.8 watts and on 40 2.0 watts. The darn rig puts out more on its harmonic!

Well, as I started to say, I've not worked any ZS's or VK's, but I did work a W3 (W3VGE) with an S6 sig in Washington. This was on 7140. Any night -- if I stay up long enough -- I can hear VP6, VK, K6, ZL, J's etc; and any night, if I stay up late enough, I can work both coasts. All of which shows that 2 watts can do just about what a W6 kw. will, and without half the QRM. I forgot to mention that the 'A' battery runs a worn-out auto vibrator (cost $5) with a hot 150v. at 20 ma. to the 6L6, about half of which I use, holding the rest in reserve when I get a good loud VK that seems like he won't answer -- which he doesn't."

Essential ingredients of the realistic QRP'r emerge clearly in W7FHZ's account: a good sense of humour and a dogged persistence in calling even though you know they won't answer!

Sutter's discussion of the 'Portable Five' was the earliest complete treatment of QRP in the format which has become standard. It had been preceded by another feature story five years earlier (*QST,* June, 1934) which detailed the exploits of a pair of QRP'rs in a 'dream' location. That piece was written by Philip L. Ennis, K7BWZ:

III. Flea Power in the Artic

The Story of a Low-Powered Emergency Transmitter Built from Junk

Philip L. Ennis, K7BWZ

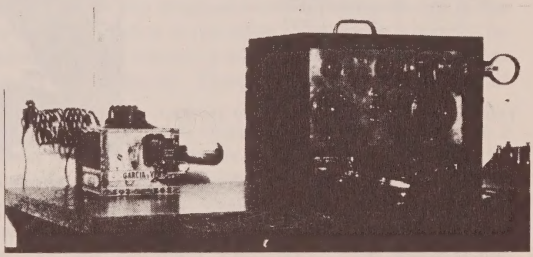
Reprinted from QST by permission of the Editor

"Last year the author bettered the depression by taking a job in Alaska, but was unable to take a transmitter for the trip because of the expense of

what was thought to be adequate equipment. However, a good a.c.-d.c. shortwave receiver, employing a Type '36 detector and two '37's for audio, was taken along. All 'r.f' [*amplifier stages*] was discarded for circuit simplicity. Five minutes after the receiver was put on the air the writer regretted he had not brought along a transmitter. Under the Northern Lights the whole world pounded in. W's from all districts were heard; ZL's, VK's, K6's [Hawaii], J's [Japan] and countless others. It was an ideal spot -- a veritable ham's paradise, for reception at least. There was no local interference, no blanketing by neighbors, no 'rock-crushers' filling the air with 'gravel'.

One evening while sitting in the radio shack and grousing because there was no transmitter available, in walked a fellow op, Charles Blair, full of optimism. We talked it over. Why not try out a custom built junk pile? It was finally decided to throw together a simple Hartley transmitter built entirely from 'what have you' -- or less. We did.

The most important need was, of course, for power. We were able to round up just 210 volts. It was thought that this would be sufficient for local or Alaskan communication -- provided we could hear any locals. A tough, chesty 201-A which lighted up like the Aurora Borealis was pushed through four holes in a cigar box -- the box in lieu of a socket. A condenser of 43 plates, built for 600- meter work, was 'borrowed' from a longwave receiver. Real ingenuity had to be used to obtain copper tubing for the inductance. A machinist who thought we really wanted to do a bit of 'bootlegging' on the side finally surrendered a few feet on our promise to give him some of the first 'distillation'. Thus equipped we wound our inductance -- believe it or not -- around the pegleg of a dock watchman. The peg was just the right diameter. The watchman held the tubing while we wound.



The Cigar Box Rig. *The portable receiver at the right dwarfs the 'built from junk' rig used by K7BWZ in the Artic. The 201-A projects horizontally from the right of the 'GARCIA..' cigar box with the coils stuck into the rear.*

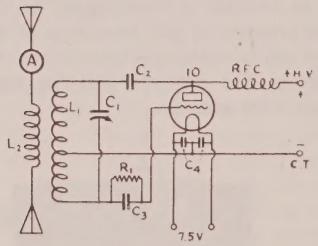
An Eskimo who owned a decrepit broadcast set loaned us a 250-mmF [*i.e.,* pF] condenser, and for a grid leak we used a discarded audio transformer. A commercial operator at a shore station contributed a 5,000v 0.001mF blocking condenser to restrain our terrific plate voltage. An r.f. choke was wound by putting 120 turns of wire of unknown size on a clothespin borrowed from a squaw's laundry bag. Another Eskimo had acquired a vintage '76 telegraph key from some place, using it for a door clapper. We acquired this for a pack of cigarettes. Not having the slightest insulation of any kind we had none about which to worry. Since no one volunteered to supply an antenna condenser we left that out also. An antenna which ranged in length, as nearly as we could guess, from 150 to 200ft was connected to one end of the antenna coil. A 33ft feeder was tied to the other end. The job was done.

It was with set jaws and a pulse hammering at between 2 mmF and 110 degrees Centigrade that we connected the 210 volts of 'high voltage' power supply and pressed down on the door clapper. Nothing happened [*i.e., no*

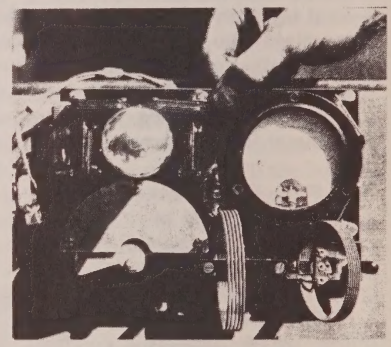
short circuits]. Finally the curtains were pulled down, and a mechanic was requested to whistle elsewhere. We took a last look at the Artic night. The stars were all in place. The Aurora was winking. The wind was ice-cold. All was set. Blair connected a flashlight bulb in series with the antenna. Glory be to Marconi! It lighted! We estimated our power at approximately 2 watts, and they were thin, anaemic and underfed watts at that. But the first contact was VE5JA. He gave us R6 [*on R1-9 scale*]. Then, in turn, W6BFZ with an R7, W7BHV, R5, and VE4GM, R5. This was the start -- and what a night it was!

During the month that followed our cigar-box transmitter -- which took just twenty minutes to assemble, tune and get on the air -- gave us the following contacts: K7CCL, K7IW, W5ATF, W6HOH, W7DBR, K7CPX, W7FS, W6FFP, W6AYQ, W9JKW, VE5HU, *K6BOE*, W7ALV, W7QI, W6FQY, W6FKC, W6ENV, W6IJX, W6AXF, VE5FE, W7CXL, W6HTQ, W6BVL, W6CLV, W6HOC, W6ZP, *VK3HG,* VE5EO, *VK2IC, J1PO, ZL2LB, ZL3GU,* W6BAY, W6DE, W6BFZ, W6FMP, W6HUL, W6CDV, W6FRH, W6EPH, K7ABQ, W6IXY, W9GUN, K7HP, W6AAP. A report of at least R6 was received from every district mentioned except Hawaii [K6BOE], which gave us R5. Many gave us better than R6 in subsequent QSO's. Our maximum DX was, of course, New Zealand, Australia and Japan.

The Final Version of the *K7BWZ* Transmitter and Circuit.



THE HARTLEY CIRCUIT USED IN THE TRANSMITTER



The performance of the haywire set was so amazing, everything taken into consideration, that it was duplicated in essential details, upon the writer's return to California. It is now in the form shown in the accompanying photograph, with proper coils, insulation, and grid leak. A Type '10 with top plate contact has been substituted for the 201-A, permitting the use of higher plate voltage. The r.f. meter replaces the flashlight bulb. The set has more than justified itself. Like its Alaskan brother, the new transmitter uses no variable antenna capacity. The tank condenser is turned to a suitable spot in the 40-meter band and locked. This leaves no parts to get out of adjustment. With plug-in coil and tube removed the entire transmitter is 2 inches high, 8 inches long and 4 inches wide. When used as a portable it slips into the battery compartment of the receiver. In case of extremely low power the meter is connected across the antenna coil to give a high reading.

It's a double-barreled nickel-plated cinch this little transmitter isn't going to ruin the night for the brother ham down the block, and when all is said and done it gets out just as far an anybody could want a transmitter to go. There is much more consideration and just as much thrill in a 'flea power' transmitter working efficiently as in a near commercial job which drives everybody elso off the air.

Sometimes stories don't get told until long after they happened. Such is the case with A. David Middleton's (W7ZC) "Pecos River QRP" originally published in *Western Amateur Radio,* and then in *The Milliwatt* with gracious permission of the author.

IV. Pecos River QRP -- Circa 1934

A. David 'Mid' Middelton, W7ZC (W4CA/5, W9WFV)

"The summer of '34 found us steaming in humid St. Petersburg, FL, where I was recuperating. We were boiling not only from the heat and humidity, but also from the perfidy of an insurance company with which we had been fighting for a disability claim payment. Frankly, we were broke! Lured by photographs and correspondence from W9FYK (now W6OWP) and a former goldminer, we were planning to migrate to the heights of Colorado via the wilderness area of New Mexico, into the high Rockies. My doctor had also ordered me out of the ennervating South.

Realizing that the White Phantom Hupp-8 would be heavily loaded, there would be no room for the 1934 type ham station equipment used at W4CA. Money for parts was non-existent. What to do about gear? I recalled the early 30's and the fine performance of the two-tube receivers. So I built a small, highly efficient receiver from scratch. I had not used Type '30 tubes for years due to their burn-out rate in the propinquity of a KW rig, but they suited my purpose and I had three of the tubes with me. Use of the old and reliable regenerative circuit, with 'throttle condenser' for oscillation adjustment, a pair of '30 tubes (2 volts d.c. at 60ma), tube base coils for the BC band through 10 meters, headphone operation, with bandset and bandspread controls gave me a small and low d.c. input receiver. The dial was a National BM. I needed two #6 dry cells and two small 22.5-volt batteries to power the receiver. I had no money for them. After much effort, I located a store run by a ham (I forget his call, but bless his memory) who let me have the batteries using several Jewell meters as collateral. Things were tough in 1934 and there were no Mastercharge Cards!

The receiver worked well after the usual minor adjustments to the coils. I packed it with my Baldwin 'fones and some wire for an antenna, and the priceless batteries, for the trip west. The day THE check came from the insurance company for a year's back payment, plus assurance of a $40 monthly check to follow, we headed west. After a leisurely trip across the southern part of the U.S. we arrived at Albuquerque where we were greeted by the locals, one of whom was W5AAX (who as *6CTO* had been my first '6' QSO back in 1924). I demonstrated the receiver for Elmer and the other locals whom I visited. I had tested the unit several times on the trip West and was delighted with the performance of those '30s, even though they were somewhat microphonic. Even the BC band worked well. Remember, in 1934 there were no transistor radios and even car radios were scarce -- the Hupp-8 had none.

The miner in St. Pete had regaled us with stories of the southern end of the Rockies, the 'Sangre de Christos', which were situated on the Pecos River northeast of Santa Fe. So we set out for the area, stopped at the Forest Services offices, toured Santa Fe, and then took off for the high wilderness area along the Pecos. The road to Pecos was good, then turned to dirt and gravel and rose upward sharply toward Cowles. We turned off onto the trail leading westward along Holy Ghost Creek, a landmark for fishermen for many years. The road was rough and dry. We rented the last cabin at the end of the Holy Ghost and settled in for a stay. We soon ran into trouble!

Although the weather was beautiful 'blue-sky', sunny Indian Summer, it was mid-October and at over 8000ft the nights were freezing! We had been in Florida long enough for our blood to thin. Working together, Charlet and I could not drag in enough wood to keep warm in that summer-use cabin, which had an open fireplace and a wood cookstove as its sole heating equipment. There was no purchasable wood in the vicinity either. On our second morning, we were shocked to find a milkman, laundry, and grocery man offering us door-side delivery! We thought we were in a wilderness!

I set up the two-tuber and strung out the hunk of wire to the nearest tree. In spite of the deep canyon we were in, reception was fantastic. I had never heard any place so quiet! The nearest power lines were over 50 miles away, and a pair of '30s do not generate much internal noise. Listener's Heaven!

W4CA/5 At Pecos River. *The Type 112 Hartley oscillator and coils are on the top shelf. The receiver is on the table.*

After a few days of perfect weather, the typical high mountain early fall rains began. We needed to go to town, so we started for Santa Fe, via Pecos. This was my first venture in off-pavement driving on this wilderness trip, and I had not reckoned on the wet adobe mud that is so common in the west. The Holy Ghost Creek-Pecos River road is mostly shelf-type and in 1934 was a hazardous drive on slippery mud. Had I realized it, we would have chained up -- if we had had chains! Charlet did not drive, so it was up to me, and I was not up to it! That we could get down was a miracle due to road conditions, but nothing could get me to drive back up that road! Not even to retrieve our goods and gear!

We then rented a cabin at the Pecos River Fishing Camp, a then famous hostelry, and Charlet went back up to the Holy Ghost cabin with a hired driver and his truck to bring our things back while I stayed safe and sound, if shaky, in camp. Indeed, it would be 24 years later that I finally did drive back up the Pecos road to the 1934 Holy Ghost Creek site, and that was on a dry July 4th.

To describe our Pecos cabin as small is an understatement. it must have been built for midgets. We had a double bed, a wood cookstove (for heat also), a small table that let down from the wall, and two chairs. With the two of us inside, it was crowded. I built shelves over the end of the bed after I measured 18 inches of 'sitting room' between the bed and the wall. We were as snug as two bugs in a rug, but we had no power of any kind. We used a lamp for light and wood for heat and cooking. The nearest power plant in Pecos was over a mile away at a garage where there was a one-lunger used to run 100-volt a.c. gear for the garage.

After putting up the old faithful off-center Windom by casting fish lines over two huge cottonwood trees, we discovered that we had perfectly quiet reception. What a location! It was the most quiet spot that I had ever been in to date, and only the Flat Top area described in "The Perfect Summer" would ever surpass that Pecos River QTH for radio reception.

But alas, I had no transmitter of any kind. I had a few crystals that I had tucked into our suitcase and that was all. A plea by mail to W8AKA brought a box of assorted junk including a Type '89 tube. I haywired a Tritet (remember George Grammer's famous crystal multiplier circuit?). I purchased an ESCO generator from Bob Henry at Butler, MO, that put out around 300 volts with 6 volt input. The battery from the Hupp-8 provided primary power for the generator. Finally I had a transmitter on the air that was truly QRPp, although that term did not come along for about 30 years! My output on 20 and 40 meters was very low and contacts were few indeed. That '89 Tritet was feeble, even by W9PNE standards!

I soon discarded the Tritet and the '89 for the standard QRP rig of the day -- a Type 112 in a Hartley oscillator with copper coils. It put out quite a bit more power as indicated by the lamp-and-loop r.f. indicator that was popular in those days. I began to raise stations all over the country. Much testing and calling revealed a disastrous situation. By the beard of the old man, that ESCO generator was a glutton for d.c. amps as it knocked down the heavy duty Hupp-8 battery in a hurry. I could only operate a short time, then let the battery recuperate and then try it again, but even those tactics did not work for long. There was no way to charge my battery at our camp. This I discovered too late. No one had any equipment requiring storage cells. There were no light plants in camp and the only batteries were in use in cars and trucks. Solution? To get my battery to the garage for charging, and then return it to camp. I made a deal with the grease-monkey to charge the battery for a buck. In those days, the usual fee was fifty cents! A buck was a huge item in our budget too. And then, my only means of transporting the battery was by wheelbarrow.

My first roundtrip over the rough dirt road revealed that the garage man apparently cheated me, as he had not fully charged the battery! A test with a hydrometer showed up his guilt. I later found out that his charger did not have sufficient capacity to do anything but put out a small trickle charge! But I was a long way from 'civilization' and nothing else could be done. Why did I not put the battery back in the Hupp and keep it charged? The high cost of gas and the rapid depletion of our wallet! We walked everywhere for our health.

The 1934 Sweepstakes were upcoming. Knowing that New Mexico was a rare state, and knowing that New Mexico was where I was, drove me up the wall. I wheelbarrowed the battery to the garage and pleaded with the man to give me a real charge. He did. But he raised the price to two bucks! However, he did give the battery a real jolt and I was ready for the SS, so I stayed off the air until the SS started so as to save the battery. By husbanding my calls, I

racked up a couple dozen sections in the SS, mainly on 20 meters before the battery would no longer start the ESCO. I could still receive as the two-tuber was performing well on its dry batteries. (An interesting side-note: when I sold the little receiver a year later, the #6 cells and two 22.5-volt batteries were still putting out OK.) At any rate, I had to sit there in my 18 inch sitting room and listen to the rest of the SS in that extremely quiet spot with tears in my eyes. Our budget just would not stand those two dollar charges! There were few New Mexican stations on CW in the early '30's and W4CA/5 was welcomed by the gang, if even for my brief session with QRPp. Had I realized the value of B batteries vs. dollar cost, I would have done better to do as I was to in 1936 and buy heavy duty B batteries, using the auto battery for filaments only. So much for engineering and planning. Hindsight is wonderful!

Shortly after the SS we tore down the antenna, and moved to Santa Fe. Soon I had my regular station equipment from St. Pete and was on the air on 20, 40, and 80 with W4CA/5 and a good antenna. The 110 volts a.c. seemed very good, even with the usual line noise and racket. Santa Fe was put on the map by W4CA/5 as there had never been an active CW station there, and, having little else to do, I was at the key a lot of the time.

I will never forget those few weeks on the Pecos River where the loudest noise was the river gurgling away about 50ft from our cabin, and where there was NO line noise, no TV horizontal rasp, no racket, and the only signals on the ham bands were HAMS. What could I have done with an HW-7, a PM3A, or an Argonaut! But, alas, I was there 35 years too soon!"

Middleton went on to an even better QRP experience in 1936 and told about it *The Milliwatt* in "Perfect Summer Plus QRPp". The story gives the modern QRP'r a close-up view of some of the difficulties bestting operators of the rigs of the 1930's.

V. Perfect Summer Plus QRPp

A. David 'Mid' Middleton, W7ZC (W4CA/5, W9WFV)

"Late summer of 1936 found my wife Charlet and me in the Colorado town of Rifle, hot and dry. A friend knew a friend who had a cabin on the Flat Tops, near the Old Ute Trail, in white pine country lying north of Glenwood Springs. 'No', she could not *pay* us anything to caretake for the summer, but we were *free* to use the log cabin as long as we wanted, just to 'have someone' there! The 'someone' was us. Quickly, we made arrangements and the friend took us up to the cabin about the first week in June. The snow drifts (at 8500ft) were still piled up in the shadows. We hiked the last two miles from the Flat Tops to the cabin, which lay on a wide shelf down a few hundred feet. The location was absolutely startling. We could see down into the South Fork of the White River, some thousands of feet below. From the site, at night there were only a handful of lights, and visibility was unlimited. Truly, this *was* a location! The cabin? The builders had not spared size and comfort. It was huge, equipped with an attic, a bed (good), an iron range (wood type), screens for the windows, and a crystal clear spring and stream about 25 feet from the door. There was even a shelf-like table which served for a rig operating table.

One problem -- the site, located at Cliff Lakes (there were five lakes, some of which had been used as a private trout raising farm, and teeming in trout) was 45 miles from Rifle, over a terrible road for about 40 miles, and then an even more hair-raising cliff-hanger of a road for the last two miles! Not for the weak at heart, to be sure! There was no power line within 45

miles! And the nearest occupied home was seven miles away! "Would this be suitable for you?" we were asked hesitatingly by the owner. You can imagine our answer -- a rousing *yes!*

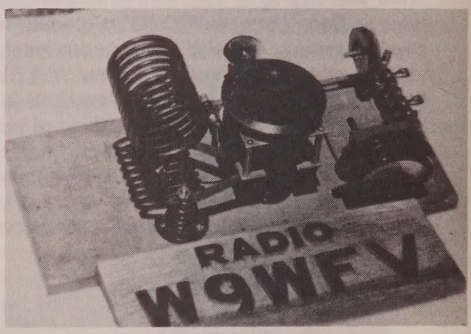
In our brief stay at Rifle, I had given the ham license exam to a man who had been waiting a couple of years for someone to come to Rifle who could administer it. There never had been a ham resident in Rifle. This man let me set up W9WFV in his garage where there was room for an antenna, which room was lacking at the small rented apartment where we had taken up residence. Soon the new W9YPY (Colorado was part of the W9 area in those days) was on the air with *my* home station rig and going great guns! Since he was the closest ham to Cliff Lakes, W9YPY was to be our outside contact from the cabin. There were very few hams in all of northern Colorado at that time! And we would require some kind of reliable contact with the 'outside' if our summer was to be practical. After all, seven miles of bad road to the nearest people and 45 miles from a town of any size -- wow!

Location of 'Perfect Summer'. *W7ZC did not exaggerate in describing the setting of the story! Note the conveniently located trees.*

What to do about the rig? I had no generator (they were very costly and uncommon in 1936) and there seemed to be insufficient wind for a wind-driven generator and battery setup (remember the Windcharger?) plus it was costly due to the wind machine, the batteries, and a genemotor etc. Recalling the previous QRPp work in Pecos, New Mexico, in 1934, I decided to put my trust into the car battery out of my Hupp Straight-8 Roadster, and a set of four heavy duty Burgess B batteries, which my pocketbook could afford. A Hartley oscillator was built up especially for the remote station on a bread board, with copper inductances for 20 and 40 meters. 80 meters was out due to the continuous mountain static. A Type 112A was selected. A meter was pulled out of the fixed station transmitter. Only c.w. operation was planned (I had not yet succombed to phone operation, and would not until s.s.b. came along), and I knew that a watt or two of c.w. would do the trick. The transmitter was constructed to be rugged, reliable, and stable. I had some spare '112A's along just in case. The power supply? A calculated 180 volts of pure d.c. This would give me about 3.5 watts input.

I already had a receiver for this job, one that I had put together during the winter. It was a '78 regenerative detector, with screen controlled voltage for regeneration control, and a '76 audio amplifier for use with headphones. This receiver ran off two 22.5- volt B-batteries, small size. The circuit was the

'never-fail' variety. Quiet, simple (with hi-C coils in the detector), well adjusted, and with a 'starved audio amplifier' circuit as a noise limiter: it was superb for portable operation. A National Velvet vernier (6:1 ratio) dial tuned the frequency once the bandset was locked down. Band spread was good and selectivity excellent!

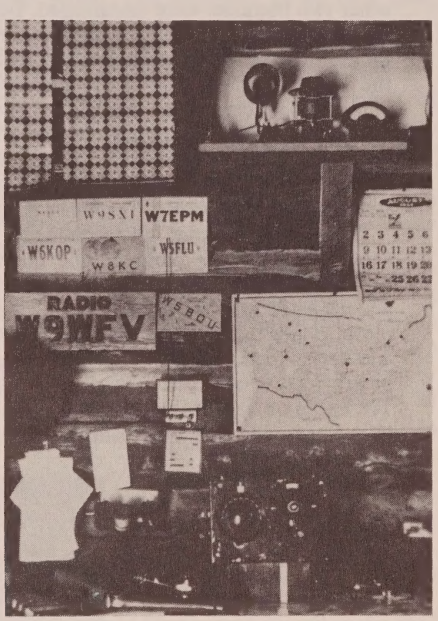


W9WFV Hartley Oscillator. *Note the coil wound from 1/4-inch copper tubing, and copper strip leads. The top of the Type 112-A is seen just above the large knob. Same low-loss construction approach as used in the 1920's, with components mounted on stand-off insulators.*

I ordered batteries from a Denver supply house and those big Burgesses cost plenty, and the shipping cost was out of sight! But they were solid, reliable, and pure d.c. That was important for QRPp operation. When the batteries finally arrived, we loaded up the Hupp with our gear for both house, radio and stomach. Not being neophytes at this type of isolated living, we knew how and with what to supply ourselves. We planned a trip to Rifle every week or ten days to resupply.

The table was just right. The receiver and key sat there at the right height. Above that I put a small shelf, attached solidly to the huge log side of the cabin, and put the transmitter there. A knife switch was used for the antenna change over, and to cut off the 180 volts when not using the station. A genuine 40 meter off-centerfed Windom was raised by climbing as high as I could in a pine tree and attaching the other end to the cabin. The feed system was simple. No SWR bridge, no FS meter, NO nothing to complicate things! One problem was how to set the frequency on the transmitter. Remember that in those days one used a single frequency per band usually, and seldom moved around the band. But how to set that frequency where I wanted it was the hitch. I neglected to do it at the base station of W9YPY on my regnerative receiver, alas! But I remembered a story in *QST* where a young lad (having no elaborate gear) had covered his receiver with a metal pan, thus making a monitor out of it. I tried this, but it didn't work. Fortunately, I had brought along four #6 dry cells, and I took the receiver and the 'Blue Bells' and carried them about a quarter mile from the cabin. With Charlet (the XYL) at the window with one hand on the transmitter dial, I signaled her when she had tuned the transmitter to the part of the band where I wanted it. She noted the dial marking. Then the same procedure was followed for the 20 meter band. I was all set! The remoteness of the receiver from the transmitter and operated without an antenna, eliminated the desensitization of the regenerative detector caused by transmitter r.f. back in the cabin, and the setup gave me the monitoring capability I wanted. I had no calibrated frequency meter, having sold it in Florida in poor times!

Then schedule time came around and W9YPY almost knocked the cans off my head with the 50 watts crystal controlled rig in Rifle. His code was poor but sufficient. We had made arrangements that if we missed two schedules, W9YPY would come charging up the mountain to see what had happened to us! There was no way, short of walking seven miles, to get help under any circumstances. The rig worked fine. Schedules were set with W9ESA in Denver and with other stations, so that we would have frequent and reliable contact with the outside, even if W9YPY could not make it. We ordered things by mail from Monkey Wards in Denver via W9ESA, and they would be waiting for us in Rifle on our next resupplying trip. One of the orders was for chains! A severe mountain flash flood had left us stranded for days and we wanted chains so that, when we eventually did get back to Rifle, we would be able to return to the cabin under similar circumstances. Ah, radio is a great thing!



W9WFV Station. *The 112-A Hartley oscillator is located at top right on the top shelf. The new receiver is on the table at center. Calendar is set to August.*

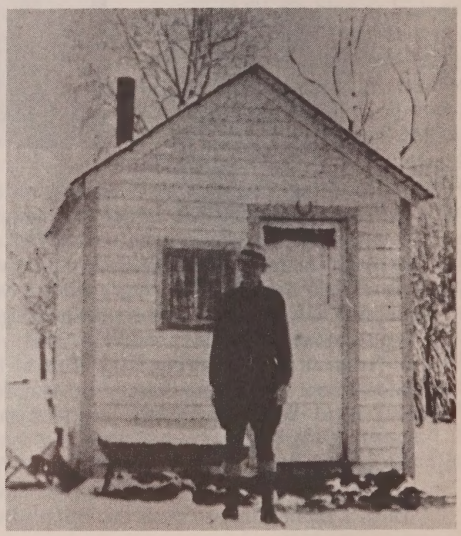
Receiving conditions were ideal. Never in my 53 years of hamming have I ever heard anything like it, before or since! There was, of course, no line noise. There was little static on 40 and none on 20 (except during local storms). The receiver was so quiet that it was difficult to tell if it was operating except for the faint 'hiss' when it went into regeneration (the true measure of a good regenerative design). Signals blasted my ears on 40 and 20. I spent many happy hours with that QRPp rig!

After we got the car down the cabin by hauling the battery back up on the skids, I kept the battery charged either during trips or by running the engine. Only once did the charge get low. And gas was a lot cheaper in 1936 than today (1973). But when the battery did get low, it was a serious problem. It was hard to crank that old Hupp by hand. When I mentioned to another station that my battery was giving out, he advised 'push the car to start it'. To which I replied that to push the Hupp would have meant a drop of several

thousand feet, as it was sitting right on the edge of a deep canyon. All that was holding the car was a buffer log, so no push! After leaving the battery sit overnight and waiting until the motor warmed in the sun, I did crank it. After that, I never let the battery run down that far.

I worked a total of 36 states on 40 and 20 during that summer. I don't know how many contacts I made. There were many skeds kept on both 40 and 20, and lots of ragchewing. Early on, an event occurred that still leaves me limp when I think about it. About the second day on the air, I somehow dropped a piece of #14 wire so that it fell across two of the Burgess batteries (45 volts). They had open Fahnstock clips, remember, and they were open! The first thing I noticed was the smell of hot wire. Then I saw a curl of smoke from under the table. I quickly knocked off the wire and sat back to survey the damage. I had a Sterling B-meter (watch case type). The two shorted batteries measured about 20 volts each, instead of the normal 45 volts. The other two batteries were undamaged. Believing that I was just out of luck, I disconnected the two shorted batteries and went to lower QRPp with 90 volts on the plate of the transmitter tube. Several days later I chanced to measure the two shorted batteries, and lo and behold, they were back up to around 40 volts. I reconnected them into the circuit and went QRO! Incidentally, those batteries were in continuous use there and later. 10 volts less than those which had been untouched by the accident! I reported this to Burgess later on and they were non-plussed, but delighted. A good testimonial for those old type Burgess batteries, the ham's delight!

The summer passed all too quickly. What with squirrel, grouse, rabbit, some deermeat we found on the doorstep, all the fresh strawberries we wanted, and trout unlimited, we certainly did not suffer! The rig worked well, and afforded both of us comfort and a measure of security. It also made us more friends to add to our long list of over the air pals. In those days, QRPp was very uncommon, and I was usually called a 'fibber' when I reported my power. I often wonder what the perfect summer could have been with a Ten-Tec PM3a or Argonaut. . .Well, that '112A and the '78 and '76 did their work in yeoman style and I was satisfied. Never will I forget that Perfect QRPp Summer of 1936!"



A. David Middleton, W9HFV/W7ZC, *in front of the cabin mentioned in 'Pecos River QRPp' - it's 'QRP' size is obvious. Note the snow on the ground.*

Chapter 9
The Uprising of '37

"...It is our aim, if the cooperation of enough stations can be enlisted, to have a portion of the 80-meter band set aside for flea-power work..."

The continual publicity given to low power accomplishments up to 1937 created a sense of group identity for low power operators. Unfortunately, the constructive dimension of that identity, *i.e.,* the ideals of knowledge, skill and efficiency embodied in the *New American Amateur,* was somewhat muddled by the fact that the low power operator was so frequently enlisted as the antithesis of the detested 'California Kilowatter' group. This antithesis, as we have seen, existed from the very inception of the vacuum tube age: the low power operator was presented as one who *had* to achieve efficiency and operating skill to survive, while the kilowatter was frequently imaged as a wealthy, unknowledgeable dolt too lazy and dumb to do anything but 'blast' his way through with brute force frequently consisting of a "rotten signal", to use the favorite phrase of the day. Of course, neither stereotype was accurate. But everyone agreed that the ignorant kilowatter did magnitudes more damage than the shoddy QRP'r.

While the high power QRM controversy raged on, pitting the 'California Kilowatts' against the rest of hamdom, constructive efforts were going at the ARRL to give focus to certain areas of amateur radio activity through the creation of an array of operating events and awards "to benefit all amateurs along each line of natural interest". It was during the first half of the 1930's that the 'contest' concept emerged and was applied to events such as the 'ARRL Annual International Relay' which turned into the 'International DX Competition' and then the 'International DX Contest'. Part of this effort included the creation of sub-groups within the ARRL (the main 'club') and the results included the '20 Year Club', the 'ARRL Emergency Corps', the 'A-1 Operator Club', the 'Rag Chewer's Club', the 'Worked All States Club', the 'Worked All Continents Club', and, in September, 1937, the 'DX Century Club'. In each instance, some recognition in the form of an award was given for qualifying amateurs. In several 'clubs' such as the W.A.S., W.A.C. and D.X.C.C., the operator gained membership of an honorary form after he'd particpated in the long-term activity and provided QSL proof of contact with stations in all 48 states, all 6 continents, or 75 or more countries.

As we've seen in the 'Sweepstakes' and 'Field Day' results as well as the 1937 'Low Power Contest', QRP'rs certainly received their share of the recognition and an official event. Furthermore, the calls for 'Miles Per Watt' and 'Low Power' records definitely aimed at providing recognition, and suggests that the ARRL saw something in such work that was worth recognising. The puzzling question is: given that viewpoint, why did the ARRL somehow fail to see the logical implications of their publicity for QRP, and then go on to create an official niche for QRP'rs in the clubs and awards structure? Perhaps it was simply a matter of missing the forest by looking at a tree; and how could the ARRL recognise an operator who wasn't a particular sub-group, but "whose name was legion" in Handy's terms. Perhaps many of the members of the W.A.S. or W.A.C. club were low power types, and a sub-division (such as 'W.A.S. QRP') didn't make sense. Or it may have been a different kind of matter, with F.E. Handy and E.L. Battey (and probably Editor K.B. Warner), the staff members responsible for the QRP publicity, pushing for recognition of the low power operator, but meeting

resistance from the staff and Board of Directors? (Such was the case, regretably, during the late 1960's and 1970's when the QRP operator had a staunch ally and supporter within the ARRL organization in the form of Doug DeMaw, W1CER-W1FB, but to no avail as far as official recognition was concerned.) At any rate, the ARRL did not elevate low power operation to the status of a 'club' nor did it give it recognition in the form of an award. It is not surprising, therefore, that members of this largest group of operators would eventually seek some sort of official recognition for their particular 'line of natural interest' along with the Rag Chewer's and the others.

And when Robert A. Curtis (W1EXZ) stepped forward to seek a radical form of recognition for flea power operators in a cooly reasoned, diplomatic letter, he unleashed a unprecedented response from his low power colleagues that spread across a half-year's worth of *QST*'s. The appearance of this series of letters, it should be noted, was the result of an editorial choice made by K.B. Warner. W1EXZ wrote in 'Correspondence', *QST,* February, 1937:

Flea-Power Association

This letter is to introduce you to the "Flea Power Association", a new organization of radio amateurs to stimulate flea power activity on the amateur bands as a definite help in solving the QRM problem. We think that the use of flea power on the more crowded amateur bands by a good percentage of amateurs will do much toward helping to eliminate the excessive QRM on those bands, which at times is intolerable. We are soliciting your cooperation in this matter.

There is on the air today a large number of amateur stations operating with flea power, 25 watts or less; but these stations are greatly handicapped by the number of high-powered stations, which cause most of the QRM. Nor can it be denied that many of these low powered stations are owned by operators who are unable to afford higher power, and also by those who operate low powered stations for the enjoyment and satisfaction they get from DX on low power. We would like to see these fellows get a break, not to be crowded off the bands altogether. I believe the A.R.R.L. is well aware of the accomplishments of flea-powered transmitters. For the past six months here at W1EXZ I have had in operation a transmitter with an input power of only 1.64 watts, and with it I have worked VE1, VE3, W1, W2, and W3 on 3600 kc.

It is our aim, if the cooperation of enough stations can be enlisted, to have a portion of the 80-meter band set aside for flea-power work. The band from 3600 to 3700 kc. has been suggested as a possible range. If this aim could be realized it would certainly give the low-powered fellows a break, and also leave a good portion of the band to the high powered signals. I think you will agree with me that this will be to the advantage of all. It is not impossible to copy a signal through QRM of approximately equal signal strength, but try and do it through QRM caused by a kilowatt or even half-kilowatt station.

Furthermore, in the construction of flea power the ham must utilize his ingenuity to the fullest. His transmitter should be made to operate at the peak of efficiency, for, with flea power, it takes a well-made outfit to go places. Is it any great accomplishment to work DX on a high powered rig? Even with losses and poor operating efficiency a high powered rig can send out a good signal for hundreds of miles, but consider the thrill you get when you are sending a signal out a few hundred miles with each watt input.

The F.P.A. is not anti-high power, but we would like the cooperation of the amateur fraternity in bettering the conditions on the amateur bands so that the

fellows with flea power can get more enjoyment from their efforts in amateur radio as a hobby.

Robert A. Curtis, W1EXZ

W1EXZ's letter brought together the important motifs that had developed in the context of the *New American Amateur*, the publicity of what low power could do, and the high power QRM controversy.

W1EXZ's radical suggestion reduced the matter into simplest terms: the low power man could not compete with the 'watt hogs', so banish the 'ether busters' from territory in which the average radio amateur would have a fair chance of enjoying his hobby. In pragmatic terms, the proposal simply accepted the established reality: the appeals over the years by Kruse, Hatry, Schnell, Battey, Handy and others for 'fair play' and consideration from the 'ether busters' had fallen on deaf ears. The 'watt hogs' had been given their chance and refused to budge; hence, force them off portions of the amateur bands. Curtis limited his proposal to the 80 meter band. This modest beginning, however, extended to "bettering conditions on the amateur bands", which was possible only if the other bands eventually were included. The 80 meter low power operator wasn't the only one who suffered from high power QRM -- so did the operators on 160, 40, and 20 meters, a fact which was obvious from the years of controversy. The really radical aspect of W1EXZ's proposal is found in the size of the suggested portion of 80 meters to be set aside: *100 kHz*! Not '10 kHz' or even '25 kHz', but 100 kHz! (Why not go for the whole c.w. portion?) Respondents to W1EXZ's letter predictably ignored his restriction of the proposal to 80 meters and read "flea-power section on our bands". However, they all acquiesced in the limitation of those sections to the c.w. segments. This may be due to the fact that beginners and grassroots amateurs could not afford to build and operate 'phone transmitters which were usually high power, and hence generally were c.w. operators.

The responses to W1EXZ's proposal were numerous, as the Editor's note in the May, 1937, issue remarked. It was the only instance of such an Editorial note prior to WWII (and perhaps afterwards). But there is something extraordinary about the appearance of the first two responses in the very next issue of *QST*: as anyone associated with magazine production lead-time and deadlines knows, the 'next' issue is usually at the printers by the time the previous issue is read by subscribers. Perhaps it was different in the 1930's and there is no significance in the appearance of letters from R. Bach of New York City and W9FWL in the March, 1937, issue. The latter presents no problem: it makes no reference to W1EXZ's proposal, and, in fact, its opening reference to "this raging controversy" and "Yes, it's the same old thing" places it in the context of previous exchanges about high power QRM which were scattered through issues stretching back to 1932. Furthermore, W9FWL's proposal is foreign to the concept offered by Curtis. These facts suggest that Editor K.B. Warner had W9FWL's letter on hand to insert into 'Correspondence' whenever he saw fit. Titled "Hi- vs. Low- Scheme", it read:

> "...Yes, it's the same old thing -- High Power vs. Low power. I have no permanent solution to this raging controversy but possibly an idea which might bring temporary relief and be workable if conformed with wholeheartedly [*W9FWL proposed one day per week exclusively for under-200 watts and one for over-200 watts*]. I realize that this would be a restriction in particular on the operating of all low powered men (I'm one of 'em), because we would have to remain quiet during the high power twenty-four hour period. The high powered boys could lower their input and operate all the time but out of courtesy's sake I don't believe they would. Even if they did come on with reduced input it would still be a blessing to have those kilowatt rigs cut down

one day in the week. To me it seems a possible solution for obtaining a better chance at hearing and working those far away DX stations which now are always covered up by heavy 'W' QRM. If the idea was tried we might draw some valuable conclusions."

Hugh Foster, W9FWL

However, the letter from R. Bach responded directly to Curtis' proposal as well as another article in the February, 1937 issue. It was titled "More With Less Power"and read:

"In February's *QST,* Mr. Curtis, W1EXZ, presented a very workable plan to reduce QRM on the ham bands. His plan is one which should be given much thought as it gives us a chance to reduce interference and increase enjoyment on our bands. Mr. Curtis said everything that could possibly be said in favor of low power. To gain a larger and broader understanding of the points made in his article, we should all read Mr. G.H. Johnstone's article, which won the C.D. Contest for February [1937] [*see Chapter 6*]. Now, put the two articles together. The first, low power, plus the second, a selective, sensitive receiver, equals less QRM and more enjoyment for all. Let's consider these sensible suggestions so that we all may end up by saying more power to less power!"

R. Bach [no call given], NYC]

Aside from the mystery of how 'R. Bach' received the February issue in time to write a letter which was included in the March issue, Bach described the Editor's strategy for the February issue: "... put the two articles together ... equals less QRM and moire enjoyment for all ..." It seems possible that Bach's was an invited response to materials proof before they were sent to the printer. And the sequence of letters that followed seems to have been part of an editorial campaign to gain support for the 'Flea Power Association' idea. The first of that batch of letters surfaced in the May, 1937, issue.

That letter was from Norman B. Underwood (W8DYM-KA7NU), a high power operator "but only in self-defense" whose perspective was conditioned by operation from a DX location. Underwood extended Curtis' proposal to all bands, to be backed up by an F.C.C. regulation as well as official ARRL recognition. He also added the motif of emergency preparedness to those cited by Curtis:

"I heartily support W1EXZ's suggestion that a portion of the 80 meter band be set aside for flea-power work, although I would like to see a similar section designated in each band. The special sections need not be large, but I suggest that the power limit be fifteen watts. Not only would this give the low power fellows a chance to get out, but I'm sure the high power chaps who have already worked everything would have a new stimulus to see what they could do with low power. I predict WAC's proudly qualified by their owners as to the small power used. And it would give those of us who want to build and test low-power emergency transmitters a chance to see what they will do. From personal experience a good distance away from North American QRM I know low-power rigs can get across if only the signals have a chance of being heard. The biggest thrill I have yet had in ham radio was when VQ8AH in Mauritius told me he had only ten watts input. But it would have to be a F.C.C. regulation, with an effective check-up by the F.C.C. monitoring stations. I've gone in for high power, but only in self defense. I'd much rather spend my time seeing what I could do with low power. I think there are many others who feel the same way."

Norman B. Underwood, W8DYM-KA7NU

W3EEW placed W8DYM's reference to WAC awards in more pointed form:

"...Think it's about time the A.R.R.L. gave special recognition to him who does it with flea power. A good percentage of WAC's are made with more than 100 watts. Why not have a WAC for less than 25 watts, as W1EXZ says, that is low power?"

Alan P. Buffington, W3EEW

W2IVT called for recognition in the form of a contest and perhaps motivated the accouncement of the 'Low Power Contest' in the August, 1937 issue:

"Dear Eddie [*'Editor'*]: Lotsa fellers hve been sending letters to this column suggesting that power be limited. We gotta do sumpin abt this QRM on the bands. Abt six in the evening when ya finish dinner and as ya feel the world is a vy fb place ya decide to go on the air and hve a ragchew wid W3B-- so ya crank up the ole rig es get on. Ya hear a feller wid a vy fb R9 sig CQing so ya give him a call. He comes bk es sez, 'FB R9 hr.' So ya go ahead es tell him abt the rig, etc. He cums bk es sez 'ND QRM.' Then he sez, 'Using 20-toob super wid xtal hr!' Then QRM snows him under. Why not give low power a trial? How about a contest? Have the contest last two weekends as the Sweepstakes did and limit the power to 25 watts. Why not make a Ragchewers contest of it. Have each QSO last at least a half hour in order to get two points for the contact. Also it may be a gud idea to count a ragchew with a DX stn for a change. Practically all DX contacts are the 73 CUL [*i.e., see you later*] type. Let's hear from some of you fellows abt it!"

Wm. J. LaHiff, W2IVT

VE4BN spoke eloquently of the plight of the low power operator:

"I have just read with interest the article ... on flea-power operation, and I heartily endorse the suggestions. It is really about time that the 'forgotten man' with his little two watter is given a break. Lord knows, he has done enough work and poured forth enough effort to merit it! Better still, I say, that the flea-powered lads be given a whole band to sport around in, while we are about it, and limit the whole band to twenty-five watts. There are hundreds and hundreds of VE hams that have no high power and would welcome the suggestion with open arms. Let's keep the ball rolling!"

Howard Walker, VE4BN

The remaining letters added various suggestions and views about the proposal as follows:

"Today, in most hobbies the 'sporting spirit' holds sway. Smaller bore rifles, lighter rods and line are the trend in hunting and fishing. Lowering power is the equivalent in amateur radio. Every month in *QST* we read of the accomplishment of low- and flea-powered stations. It seems that a few watts of r.f. will cover any earthly distance. On 80 meters I found that I could easily contact W1-2-3-4-8-9 and VE1-2-3 with 5-1/2 watts input to an e.c. oscillator. Yep, I got thrills out of those QSO's! How about it fellows? Why not a more general lowering of power? It doesn't mean rebuilding. All you need to do is couple your antenna to the oscillator or buffer stage of your big rig and fire, but don't be shy about using that full quarter kw. when you feel it necessary..."

Phil Reich, W2HUG

"With great pleasure I read about 'The Flea Power Association' in *QST*. In his article he says those fellows with high powered rigs are occasioning lots of QRM and therefore the little fellow is handicapped. I think his idea is wonderful to some extent, but if the hams with low powered rigs choose the proper time to operate our stations, I think it would work much better. I have noticed that operation of my station between the hours of 8 a.m. and 11 a.m. is much better. There is not so much congestion and I always get my man. I

hope all those boys using flea power rigs will choose the right time and when congestion on the air is at a minimum."

Francisco Bou, W3ESX

The collection of letters in the May issue was concluded with the remark:

[Editor's Note.--Representative of a large amount of mail expressing opinions on this subject are the above letters. Other excerpts next month.]

The follow-up was delayed until the July, 1937, issue, and included several letters under the heading"More on Flea Power":

" ...I suggest that the A.R.R.L. petition the F.C.C. for permission for amateur stations using 50 watts input or less to employ smooth R.A.C. notes. I believe that such a practice would lessen the interference within our bands because of the property of the ear to separate sounds of different pitch even though they be on the same radio frequency. Also most interference from low powered stations comes, not from broad waves, but from key clicks caused by breaking the high voltage, and with R.A.C. permissable these stations could use primary keying without 'tails'."

Geo. Dery, W6HG

"A swell idea, this flea-power section in our bands, but I don't believe it is quite practical -- espcially from a legal standpoint. However, if a week could be run off as 'Flea Power Week' and limit power to 25 watts one week, later cut it to 20 watts, then in a few more months to 15 -- when we're down to 5 watts we'll be doing something. One of us using under 25 watts (or whatever the figure is) could call 'CQ FP' and expect no calls from stations using over the power limit for that week. Without any special effort I have accomplished the following miles per possible watt output:

Band	'Phone	C.W.
10	400 mi.	1250 mi.
20	---	250 mi.
80	---	50 mi.
160	10 mi.	25 mi.

Hundreds have done much better than this -- thousands haven't tried to! I've worked several stations whose signal report was about the same as mine, and started bringing in the fact that I was using low power, only to be dug with something like this: '... FB OM but ur still using three times mi 2 watts ...!' With low power we'll learn how to call and break in, how to get efficiency, why we should use the same antenna to send and receive, and how to reduce QRM and BCI trouble ..."

George A. Bonadio, W8OMM

"All of us little fellows would have a kw. rig is we could afford it. But if everyone had a kw. conditions would be a lot worse for everyone than they are now. I wonder if these fellows with high power, who say they went to high power just because of the QRM, ever happened to think that the QRM they are overcoming is about a dozen 'little fellows' who enjoy a good QSO just as well as anyone, but just have to pull the switch and go to bed when a k.w. rig lands on or near theirs [*i.e., frequency*] ..."

Carlos Vail Jr., W9MUR

The letter from VE5PZ was titled: "Royal Canadian Mounted Police"and read:

"Concerning the range of the low power station, I have had very good success with as low power as 5 watts into a '45 TNT, even in the evening hours, working as far as Minnesota on 80 meters. Also I really believe a person does get a lot more thrill out of working these distances on low power. Again, considering the efficiency and stability of a rig working away below its rating, there would be a lot better quality signals on the air."

W.E. Marshal, VE5PZ, 'E' Division'

"The boys who are after flea-power allocations on any of the bands are, I believe, barking up the wrong tree. It's a nice thing to wish for, but the idea is too radical and would entail too much policing of the bands to be workable. There always will be some fellows doing a bit of chiseling, and at a distance of 1000 or 500 miles you'd have to do some tall figuring to know whether a station was using more than 25 watts or had a very efficient rig and antenna.

The best way out of the kilowatt QRM problem is, I believe, W3EEW's plan of a WAC certificate for low power. And that, too, would let somebody in for a lot of checking up. Couldn't we just make a game out of this low power idea and from time to time print lists of DX worked with small rigs? If I had a kw. I'd be surprised every time I called a DX station and didn't raise him. But all I have is a 6L6 crystal oscillator and it gives me tremendous pleasure to work a KA or similar DX.

Forty-meter crystals are cheap, and by choosing several good spots in doubling to 14 Mc. you can shase DX around in fine style and select a clear channel at will. To me that plan is a lot more fun than setting a kw. at the edge of the band and blasting away like a space gun; or setting a flea power rig on one frequency and then complaining about the QRM spoiling your DX ... But, whatever we do, let's not rag the high power boys about being unfair. They're certainly entitled to a kw. if they can finance it. Rather than trying to chase them off of some parts of the bands, let's give 'em the old run-around by showing 'em that we can work choice DX right under their noses ..."

C.F. Tremby, W9VOV

The suggestions and views advanced in the 'Flea Power Association' correspondence covered a wide range indeed, but is clear that a majority supported W1EXZ's suggestion that low power operators be given a chance to enjoy the hobby without competition from high power stations. Of course, the radical notion of a low power sub-band(s) was impractical and perhaps invited legal problems. The American insistance upon 'rights' likewise was a hindrance, as W9VOV's comment "certainly entitled to a kw." indicates (and other comments by earlier writers in the QRO QRM controversy). The ARRL could not, by any stretch of the imagination, choose to support either Schnell's or Curtis's proposals and thereby alienate a significant portion of its membership. Although a 'club' for low power operators could have been created, that would have required Board action; Handy chose the only other route open to him -- the 'Low Power Contest' which bluntly implemented Curtis's concept of excluding the high power stations.

The 'Low Power Contest' announcement in the August, 1937, issue made no apologies for that blunt exclusion, but Handy delicately skirted the potential conflict with high power operators in a carefully composed explanation of the the contest's origin in 'Operating News' in the same issue. He began first by noting that "*A Low Power Contest is an inviting innovation in its own right*", and then provided a number of other justifications including "*the tried and true objectives of Field Day*". He described the Contest as "*a special activity to appeal to F.D. operators who want another*" but noted that it would not detract from Field Day, which would "*continue to see enlarged participation*" after the "*bigger and better than ever*" turnout in June, 1937. Further, the Contest would "*bring new opportunity for any station of not more than 25 watts input to the final.*" The second paragraph addressed the possible objections to the Contest: "*It is impossible to devise any activity to suit all people, all groups, all objectives, and in spite of study and compromise we scarcely expect everyone to be satisfied equally.*" All those who could do so were invited to enter and provide "*constructive criticism and* suggestions". This feedback was a necessary part of the process, for it provided the ARRL with direction:

When suggestions balance out, equal numbers for and against, we feel that activities are properly aimed. If a preponderence of thought is in a certain direction the plans are modified to follow this spontaneous indication, as experience in an ever changing world shows desirable. It is our aim to promote constructive activities within every amateur group where sufficient interest is shown. This August test is a chance to try out self-powered equipment; and for the operator with modest power to compete with a station of single receiver and transmitter units in his own power class. Some members are low power enthusiasts; some are not.

Having thus made his case, Handy threw the blanket of emergency preparedness over the underlying low vs high power conflict: "*All* should consider ..." This 'defense of the Low Power Contest' argument clearly implies the presense of an adversary. It was an exercise in rhetorical rebuttal techniques, which are used only when a counter-attack has been launched or is anticipated.

Handy wrote similar brief editorials about other new ARRL activities and clubs, but nothing like this appears in them. The editorial about the formation of the 'DX Century Club', for example, is a positive reiteration of the ARRL's policy of concern "*with the practical operating of all [sic.] amateur groups*". Handy emphasized the challenge in describing 'DX Century Club' as "*a form of special certification or recognition for outstanding DX men in our amateur ranks. When you have confirmed contacts with some 75 or more countries to your credit you 'rate' [i.e., are special*]" and membership in the 'club' would be a "*top-notch* honor". He said nothing about "*suggestions balance out*" or "*equal numbers for and against*" or "*preponderence of thought"or modifying "plans*" here.

The whole 'Flea Power Association' and 'Low Power Contest' episode leaves unanswered some important questions about power politics at the ARRL which led Handy to write his extraordinary editorial following Warner's publication of the largest groups of letters on any single subject in the history of *QST* to that time (and perhaps since). But the end results are clear enough: there was no second 'Low Power Contest' despite the fact that an unquestionable level of "sufficient interest" was shown, obvious in the statistics discussed in Chapter 7. The number of letters on the 'Flea Power Association' points to the same conclusion and led to Handy's characterization of 'the low power man whose name is legion'. Furthermore, the occasional references to 'miles per watt' records in 'Communications Dept.' and 'Operating News' ceased after 1937 -- thereafter the subject would be broached only by 'letter to the Editor' or feature article writers. And the tone of the Sweepstakes and Field Day reports changed after the 1938 installments.

It seems reasonable to conclude that the 'powers that be' squelched this grassroots uprising. That is probably how it was perceived by the ARRL power structure. Bear in mind that 1937 witnessed one of the most brutal episodes in American history short of the Civil War and racial violence, namely, the formation of the labor unions which were quelled by squads of 'goons' and industry-controlled police forces. The low power uprising simply got out of hand and put the ARRL against the wall. Only one letter appeared in the June, 1937, issue about the 'Flea Power Association' and is worth considering in the context of the political evironment, since it may have been the proverbial 'straw'. C.R. Wentland (W9OTL) opened "'Power, Etc" with "*Surely am glad to see the gang wake up to low power*", presented observations about QRO QRM on 160 meters, then suggested putting "*aside the lower half of the 160 meter band, or of all bands for that matter, for power less than 50 or 100 watts, and measure it by accurate instruments in the final stage.*" Then the resentment so frequently attributed to the beleaguered low power operator burst forth:

I am beginning to wonder if this high power affair is a 'racket' sponsored by part manufacturers or if those of us with low power have to get off the air, and let the big boys run the place. Some of us may as well sell out because we can't afford the big job needed to cut through the QRM. Looks as though fishing, gossiping by telephone, card parties or 'benders' will be cheaper and more enjoyable than blah-blah-blah!

The sentiments of the dispossessed and the poor of The Great Depression show through as clearly here as in a novel by Jack Conroy or John Steinbeck. And Wentland threw a direct challenge at the ARRL to live up to its role as an organization which was supposed to be democratic and represent all amateurs:

Here's more power to the little fellow -- may the ether through A.R.R.L. be delegated to his use. May we have a vote on the situation and make this a land of equal opportunity regardless of monopolies by "corn fed kw.s." Give our "razor-back watts" a place. Yours for the underdog whose bark is quenched by the blast of the *beast.*

C.R. Wentland, W9OTL

This was revolutionary rhetoric in the context of the period and Warner knew it! Editor K.B. Warner deserves recognition for having had the courage to publish Wentland's letter, thereby inviting the wrath of the ARRL power structure. But he'd worked shoulder to shoulder with Kruse and Hatry and fought for the same group of ideals in the early days. His publication of Wentland's letter went too far across the line: the ARRL certainly would hear of no such thing as a "vote" in Wentland's terms! Actually, Robert Curtis had no such thing in mind when he submitted his "Flea Power Association' proposal. What he envisioned was exactly what he wrote: "to introduce you to the 'Flea Power Association', a new organization of radio amateurs", a 'club' independent of the ARRL's organizational structure which was represented as already being in existence. But at the time, it was only an idea, as Curtis notes. He did not pursue the formation of 'The Flea Power Association' because time was lacking following marriage and relocation. One of the most fascinating aspects of the 'Uprising of '37' is that, according to his best recollection, Curtis received not a single piece of mail about the proposal! The significant fact is that the grassroots membership of the ARRL responded to W1EXZ's proposal on the universal assumption that it was the ARRL's job to implement it! The ARRL rejected that call to action, suppressed the overt pursuit of the low vs. high power issue by Warner, Handy and Battey, and left the "*underdogs*" at the mercy of "the *blast* of the *beast*".

Chapter 10
1945-1960:
Before the The Transistor

I. A Few QRP Triumphs, Mostly Routine QRP

"...it's worth a second look when the trick is turned by a 'W' with 20 to 25 watts output..."

Even though Schnell's suggestion and others like it during the prewar years failed to stem the tide toward ever higher powers, it is certain that many amateurs had neither the inclination nor finances for a 'move up' to high power. Some sense of the power levels being used then can be gotten by scanning through the 'Station Activities' sections of *QST*. The March, 1940, issue produced the following clippings related to QRP:

W0MCN has four states on 7 Mc. with 1/3 watt. -W0DSR is active on 28 Mc. with only 3 watts. -W0LYN received Class A ticket will use 6L6 in final with 21 watts on 7 Mc. -W0ZQP operates on 1883 kc. with 1.5 watt. -W0GAG has a homemade receiver and 6L6 crystal unit. -W0OYS has 20 watts to a 6L6G on 3.5 and 7 Mc. -W0BIU got a new bug for Christmas, worked YS2LR and a flock of CM's and K4's with a 6L6 on 7 Mc. -W0NCL is on 28 Mc. with a 6L6 oscillator. -W0UNO raised skywire and worked FB on low power. W0DUC is on 7 Mc. with 6L6 oscillator. -W0ANW and GZW have new low power on 1.7 Mc. phone. -W0FFP is going places on 3.5 Mc. with -- yep, just 2.5 watts. -W0HFS increased power to 10 watts. -W9HMD uses a 6L6 with 25 watts input. -W9BXY and CUT have low power rigs on 1.8 Mc. phone. -W9UYZ using 15 watts does right well 160, 80 and 40 meters. -W9NYH worked 38 states in 20 hours using 7.5 watts. -W9WXL is running low power 3.5 and 14 Mc. -W8TXI is on 1.8 Mc. phone with 5 watts. -W5INA has 14 states using only 9 watts input.

In that issue, powers of 50 watts or more account for only about 50% of the references to power levels. It should be born in mind that these reports are by no means a valid scientific sample, but were biased by any number of factors, such as the attitude of the SCM editor regarding power vs results, the types of amateurs who submitted reports or the types of news items thought worthy of note. By the early 1950's, almost all references to power level were omitted. Then as now, this logjam of fine print at the rear of *QST* contains a considerable amount of drivel. Nonetheless, it does create the impression that low power operation was fairly typical of the grassroots radio amateur.

Amateur radio in the U.S. began the postwar period where it had left off in 1941. The five years of wartime effort had produced advances in technology and military surplus brought a high power capability within the economic means of a greater number of amateurs than ever before. It was a chance for a new beginning, but the QRP'r found himself operating in the midst of an increasing number of higher power signals. Three random issues of *QST* from the 1946-49 period produced the following collection of low power items:

W7JHL puts 8 watts into an 807 and gets R9 reports from PA. -VE6CE blasts 3.9 Mc. with all of his 11 watts to get S9 reports. -VE7ADV hooked a couple of ZLs on 28 Mc. with flea power. -W1PCZ is operating in Stamdford with 6L6 all bands. -W1DWO took five watts to Maine and did better than at home with the regular rig. -W0FPZ made a nice DX contact with his 15-watt mobile rig:

J8ACS, ex-W0FAN of Denver. -W0DAD is having fun with his QRP rig on 7 Mc. c.w. -VE3GN is working 28 Mc. 'phone with 4 watts input. -W7PEY worked D4AXS who was using 6 watts. -W6NLQ is on 3.85 Mc. with 16 watts and a new half-wave doublet for same. -W4MEU works on 14 Mc. c.w. with about 12 watts. -W2BAY gets out with his 5-watter on 3.5 Mc. -W3MYN does nice work with 20 watts. -W9AAH runs 10 watts to a 522 and gets S9 from England. W9FNC 7 Mc c.w. with 18 watts to a BC458. -W5RX has QSO'ed KZ5, VE7, KL7, PY7, and ZL2MM with 7 watts on 7 Mc. -W2OUS is working plenty of DX with only 20 watts. -W1RIQ works plenty of DX on 28 Mc. phone with 25 watts. -W1RDB worked many stations on 3.5 Mc. with 0.6 watt. -W7JOD is active on 28 Mc. with 2 watts.

Although QRP continued to maintain some visibility in this manner, the 'Station Activities' section of *QST* creates the impression that it receded deeper into the fine print amidst a growing density of references to QRO stations. In these three postwar issues, for example, powers above 50 watts accounted for about 75% of the total number of entries, with a dramatic shift occurring from the 50-200 watt into the 200-1000 watt range. It is interesting to note that the proportion of kilowatts in these issues remained about the same: roughly twice that of the 1940 issue. However, the 300-600 watt range mushroomed! The moderately high power stations seem to have upgraded to even higher power.

Nonetheless, evidence of continued interest in QRP as a mode of operation is found in reports of QRP activities such as: "*The Adak Amateur Club is sponsoring a C.W. DX Contest for stateside contacts. Maximum power permitted is 10 watts, with any kind of skyhook. The winner will receive a special club award of merit*" (*QST*, December, 1947); and the announcement of the Westchester Amateur Radio Association's peculiar brand of a QRP contest for October 17, 1948: "*During the 3 hours of operating, between 1 and 4 p.m. EST, rain or shine, each contestant must carry his complete station alone 100ft from a starting point selected by the judges, set up equipment and antenna, refrain from using any existing local supports, and then contact as many other stations as possible which are not participating in the contest. The contest will be held on all amateur bands. A prize will be awarded to the contestant having the highest score in each amateur band*". Full portable operation wasn't all that easy in pre-transistor days!

Feature items about QRP were quite rare in the 1945-1960 period, perhaps because military gear was available to fulfill the need for portable equipment. The world famous Kon-Tiki Expedition, however, was an exception. The December, 1947, issue of *QST* reported the successful completion of the expedition in which Thor Heyerdahl crossed the Pacific in 1947 on a 45ft primitive balsa raft in order to demonstrate the possibility that the Pacific Islands had been settled by the Inca from Peru. Heyerdahl turned to the ARRL for assistance in implementing the radio communications plan worked out by Captain Bjorn A. Rorholt, LA1GA, Military Attache at the Norwegian Embassy. The primary responsibilities of the ARRL included the design and production of the radio equipment and the organization of a network of U.S. amateur stations to function as the Kon-Tiki's communications link with the world. The design of suitable equipment was no easy task: "the conditions under which the radio equipment aboard the raft was to operate presented many unusual problems" such as the lack of a watertight location for operation and storage of the radios. Lightweight and compactness were two major considerations, given the size of the raft. The expedition carried three transmitters and a National NC-173. W1CTW and W1EHT adapted the 7-14 MHz transmitter from an article in *QST* for July, 1941, which employed 2E30 tubes in all stages and ran about 10 watts input. The 28- and 50 MHz units likewise were adapted from an article in *QST* for June, 1946. A pi-network antenna tuner completed the transmitting setup. After various trials, the ARRL task-

force selected an end-fed antenna supported by the raft's 40ft mast. [*R12 Sunspot Number: 149-152* during the voyage.]

The Kon-Tiki's first 22 days out of Peru resulted in contact only with OBE, the Peruvian Naval School, due to the "dead spot off the coast of Peru" from which long distance communication via shortwave was apparently impossible, as the New York Times had warned. Kon-Tiki's 10-watt signal LI2B on 14142 kHz finally connected with Harold Kempel, W6EVM, on May 20, 1947, after which the link functioned successfully except for four days of down time. Apparently the 14 MHz circuit managed to fracture a series of crystals, and eventually the 28 MHz transmitter was retuned down to 13990 kHz for the remainder of the trip. Involved in the net were W6EVM, W1AW, W1DX, W1LYL, W3GAU, W3YA, W4KXV, KZ5AW, KZ5AZ, KZ5ND and LA3GA. In addition to the net personnel, LI2B also worked W1CWX, W1DQH, W5FNA, W6AOA, W6CIS, W6ICP, W7GXA, W8PCS, W8UJ, W9TB, W9UKO, VE3ACL, VE3OZA, KH6DD, OA4AE and ZL4DD on 14 MHz, and on 28 MHz, W4KXV, W6GAL, KZ5AW, KZ5AZ and KZ5ND. In one instance, urgent traffic passed from the raft to the Embassy and back to the raft via the 14 MHz link in 35 minutes round-trip!

Another highlight of the voyage took place on August 5. The crew radioed this information about the event: "*It was a great day for us. While in contact with W6EVM, he told us that LA7Y, whom he had just contacted, had heard LI2B. After completing the schedule with W6EVM, LI2B called LA7Y and contact was established with RST 559 reports both ways. This happened at 0630 GCT when Kon-Tiki had the position South 15 degrees 50 minutes and West 141 degrees 25 minutes. The distance would be about 10,000 English miles.*" The contact with LA7Y was repeated several times during the voyage. Finally, after 101 days on the open seas, the raft cracked up on a reef, and the QRP rig again saved the day by raising ZK1AB on Raratonga a half-hour later. Before rescue parties had to be sent out, LI2B contacted W0MNU who passed along word of the landing. The crew operated five more days on the island after being rescued by the locals.

The Kon-Tiki adventure was reminiscent of the explorations of the 1920's in which QRP rigs played such a prominent role and were often given headlines. And in fact, the world read about the success of these QRP rigs and saw photos of them being operated on the Kon- Tiki, and was left with the impression that "hams" in general used such gear. One wonders why *QST*'s Kon-Tiki feature story made no reference to the fact that this phenomenal communications success was a QRP triumph. Gone were the days of Kruse, Hatry, Handy and Battey!

In another rare instance, QRP DX'ing assumed the limelight in a feature story in the October, 1949, issue of *CQ*, "Two Zones Per Watt: W6BAX's Low-Power W.A.Z. Award", which extolled the achievement of W6BAX in working and confirming all 40 zones. The W.A.Z. award in itself was considered noteworthy since "*even in these days of countries galore, it is big news when someone can show proof of working all 40 zones*". In the context of the typical U.S. qualifiers, W6BAX's W.A.Z. #127 bore an additional mark of distinction: "*it's worth a second look when the trick is turned by a 'W' with 20 to 25 watts output from a doubler-final.*" The report continued with a brief account of W6BAX's path into QRP. In pre-war days, W6BAX was "*well known among DX hounds the world over*", using high power to a 250TH. In gearing up for post-war operation, he began with a new exciter intended to drive one of the new Eimac (where he was employed) high power tetrodes then in the final stages of development. The exciter employed a v.f.o., 6V6 doublers and an 807 functioning as a doubler-final. Beginning operation in May, 1947 [*R12 S.S. Nr.: 152*], at a new QTH, W6BAX made WAC during the first week using nothing more than an "*available broadcast receiver antenna tied to a tree*". Vee beams soon were added. Then W6BAX "*decided that the high power could wait*", given the excellent results he was having

with QRP. Finally, a 3-element rotary at 30ft was added when the going got tough. Operating principally on 20 meters, W6BAX completed the W.A.Z. in less than two years from starting date [*R12 S.S. Nr.: 152-135*], racking up 157 countries in the process! The receiver was a simple homebrew superhet "lacking even an r.f. stage". The concluding remarks bring home the secret to success with QRP: *"As usual, it's the man. Plenty of patience plus real DX know-how and smart, smooth operating have paid off for W6BAX. When a new rare one appears you can bet your bottom dollar that if he isn't fishing, bowling, or playing for the Eimac softball team, W6BAX will be there at exactly the right instant and on exactly the frequency called for by the circumstances."* Beyond the Kon-Tiki Expedition and W6BAX's QRP WAZ, little else in the way of feature stories about QRP exploits appeared in the 1945-1960 period.

II. QRP Transmitters and Testimonials

"...This is a Novice rig. It is not a beautiful rig with shiny panel and knobs and fancy panel decals..."

Aside from those stories, the history of QRP in the 1945-1960 period is much the same as in the 1930's: it is the story told about QRP results in articles describing low power transmitters. Periodically, construction articles appeared which were aimed at the beginner and featured relatively simple low power transmitters. Generally, the focus was not specifically on QRP as a mode of operation, since many grassroots amateurs operated homebrew rigs at levels nearly in the QRP range. This is revealed by the power ratings of the tubes used as the final amplifiers in construction articles throughout the period. Manufacturers listed the following r.f. power output ratings for tubes commonly used in homebrew rigs: 6AQ5: 3w; 6AG7: 7.5w; 6V6GT: 11w; 2E24: 11w; 2E26: 17w; 6L6: 28w; and 807: 35w. These power output ratings assumed a 70% plate efficiency, an idealistic figure in terms of normal practice. While the 6L6 could produce the maximum 28 watts r.f. output, such a feat required a high-efficiency Class-C amplifier circuit which included feedback neutralization of the amplifier stage. This type of circuit appeared with extreme rarity in construction articles describing transmitters using these tubes, being reserved chiefly for QRO amplifier stages. Safety was one factor: the feedback neutralizing capacitor usually carried the plate circuit high voltage and could deliver a lethal jolt if touched during adjustment. Beyond that, output power was simply not a major concern: if the rig could produce a reasonably bright glow in a dummy load 10- or 20-watt incandescent bulb, or in a #47 flashlight bulb tapped along a length of the feedline, then it was putting r.f. into the antenna and that was all that mattered. Furthermore, not much had changed since Kruse lambasted the use of tube input ratings in describing a rig as a '5-watter' without measuring the actual input. At least amateurs had taken to metering the final amplifier current in determining their input power, although they as often as not relied on the power transformer rating in assuming the plate voltage to used in the $E \times I = W$ formula!

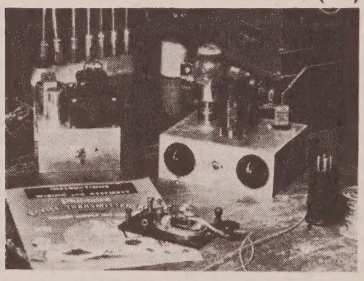
In reality, efficiencies on the order of 30% were very good in the typical unneutralizd amplifier operating straight through and being driven by a previous doubler or oscillator stage. Multiband circuits, however, frequently operated the final as a frequency doubler, in which case efficiency dropped into and below the 'teens. In a single tube crystal oscillator transmitter directly feeding an antenna, an efficiency of less than 10% could be expected. The output measurements for the Heathkit AT-1 which are noted below reveal the realities of the world of '35-watters' using the ubiquitous 6L6 during this period.

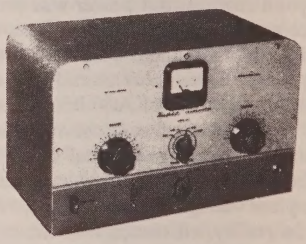
During the late 1940's, newcomers to amateur radio had few alternatives to homebrewing their first rig which was usually similar to the 'WN3COB Special' described in Chapter 1. This first step into homebrewing was followed by,

naturally, a two-tube circuit such as Assistant Technical Editor Donald H. Mix's (W1TS) "A Two-Stage Transmitter for the Beginner" (*QST*, April, 1950) which was capable of 35 watts input on 80 and 40 meters as "compared with the few watts obtainable from a crystal oscillator alone". The circuit consisted of a 6AG7 untuned Pierce crystal oscillator coupled capacitively to the grid of the 6L6, 6V6 or 6F6 amplifier stage. Two-band operation was obtained by the use of plug-in coils. A noteworthy feature of this rig is the built-in antenna coupler capable of either parallel or series tuning. Mix's 'beginner' articles are classics in regard to explaining the minutest details of circuitry and construction, an added attraction which led thousands to duplicate his rigs.

The next step for the beginner with growing homebrew experience involved either multiband capability or v.f.o. control. *QST* Technical Assistant Richard M. Smith's (W1FTX) "An Inexpensive VFO Transmitter: A Simple 20-Watt Unit for 3.5- and 7-Mc. Output" (*QST*, July, 1949) is a typical example. Back then, the construction of a v.f.o. (variable frequency oscillator) for use with a high power transmitter presented some difficulties which could be solved only through effort and expense. Smith presented the combination of v.f.o. control, low power and low band operation as a natural: "*Low power sidesteps the disheartening business of having a VFO that sounds fine all by itself, but which turns into something horrible when used to drive a high-power final.*" Signal quality was a major design objective, so the v.f.o. was operated at 1.75 MHz. For 80 meter operation, a 6V6 driver operated as a buffer stage driving a pair of 6V6GTs as frequency doublers, while on 40, both the 6V6 driver and pair of 6V6GTs as doublers. With respect to the decreased output to be expected from this configuration, Smith explained: "*Admittedly the output of the push-push doubler as an output stage is not quite up to the level that could be obtained from push-pull or parallel operation. But remember what is desired is quality, and if the output has to suffer slightly to get it, it's a small sacrifice. The difference between and 20-watt signal and a 30-watt signal is undetectable at the other fellow's receiver, anyway.*" Smith's strategy looked forward to that adopted by the QRP'rs of the 1970's who were struggling to climb onto the plateau of stable v.f.o. control with their solid state transmitters. The *QST* staff of this period continued to emphasize high quality circuitry and construction practices as opposed to reliance on power alone.

Novice Kits: Philmore NT-200 (left) & Heath AT-1.





The ranks of QRP'rs received a tremendous influx from the creation of the Novice Class license, effective July 1, 1951, permitting crystal contolled c.w. operation limited to 75 watts input on 3700-3750 kHz, and phone and c.w. on 26.95-27.23 MHz (old 11-meter amateur band) and 145-147 MHz. The initial Novice privileges were limited both in terms of power, frequency and duration, since it was a non-renewable ticket which expired after one year. Simple Novice kits appeared almost immediately to fill the demand created by the new Novice license. The Philmore NT-200 Novice transmitter and power supply kit is an example. The unit was reviewed in Herb Brier's (W9EGQ) popular "Novice Shack"

column in *CQ* for August, 1952. A 6V6 in a Pierce crystal oscillator drove a 6L6 final amplifier on the 3.5- and 27 MHz Novice bands at a rated 25 watts input; W9EGQ noted that the unit could be used on intermediate bands simply by winding the proper inductances. The unit used a pi-network in the amplifier output with better harmonic suppression than was possible with a tank circuit. He turned the kit over to prospective Novice 16-year old Martin Yuriga for construction which required "three leisurely evenings". Then Brier put the rig on 3.68 MHz and made three QSO's in a row, commenting: "*These results speak for themselves. For an input of 25 watts, a random length antenna about 25ft high, and conditions certainly no better than average, three calls and three contacts is not a bad average!*"

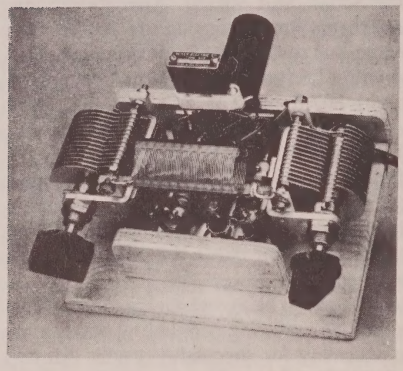
In addition to the simple kits, several all band crystal controlled transmitter kits such as the Heathkit 'AT-1', 'Globe Scout' and Viking 'Adventurer' appeared. Here, the basic strategy of manufacturers was to provide the new Novice with a rig that would be usable when the upgrade to General Class occurred. The power inputs ranged from 30 watts (AT-1 with 6L6 final) to 50 watts (Adventurer with 807 final) to 65 watts (Globe Scout with 807 final). The AT-1 was decidedly the most popular commercial Novice kit at 30 watts input, and the Novice columns were filled with its accomplishments. The low efficiency of the unit resulted in r.f. outputs ranging from about 7-9 watts. Hence, the use of input power as a standard somewhat obfuscated the fact that the AT-1 was a genuine QRP rig, although its output was a hair above the current 5-watt definition of QRP. As a result, its widespread success did little to promote the image of QRP operation, although it was commonly viewed as a 'low power' rig.

The mentality in the Novice world leaned toward using the maximum permissable 75 watts, even though construction articles featuring simple low power rigs claimed that such a high power was not necessary for successful results. An extremely popular article by Lew McCoy (W1ICP), "More Power with the AT-1" (*QST*, October, 1955), at once revealed the true power output from the AT-1 while featuring modifications to increase the efficiency of the unit and produce considerably higher output. With the unmodified 6L6 final amplifier, r.f. outputs on 80-10 meters were measured by W1ICP as 9, 9, 9, 5 and 7 watts. The conversion of the 6L6 final amplifier to straight-through Class-C neutralized operation raised outputs to 18, 15, 15, 10 and 7 watts (80-10 meters). Substitution of the TV beam-power tetrode 6BQ6 for the 6L6 final raised the input to 35 watts and outputs to 25, 25, 23, 22, and 8 watts. The integral power supply would not power a 6146 at higher levels. However, a later modification consisted of replacing the original supply with an 'economy' full-wave bridge rectifier which provided enough power to up the AT-1 to 60 watts input or more with the original a.c. power transformer.

Even though these commercial kits were quite popular, many Novices built rigs from scratch, following published circuits such as that shown in Chapter 1. These single-stage crystal oscillators were definitely in the QRP range. "The Novice One-Tuber" by Donald H. Mix (W1TS) in the May, 1951, issue of *QST* is another example of these circuits for the beginner. Mix noted that Novices could use up to 75 watts input, but "*good results can be obtained with much less than this legal limit. The little transmitter shown in the photographs is easily capable of working several hundred miles with a makeshift antenna.*" In addition to simplicity and ease of construction, Mix cited the absence of TVI as a major advantage of using low power, and to back up this point, he noted that the rig was operated "with part of its antenna inside a TV receiver without causing interference". The construction approach is reminiscent of the early days, with the brackets and tie-points supporting the components mounted on a slab of plywood (a 'bread board'). The circuit used a single 6AG7 as a Pierce-Colpitts crystal oscillator on

80 meters. The novel plate circuit consisted of a pi-network designed to feed a random wire antenna. This first offering by *QST* (carried over into the *ARRL HANDBOOK* as late as 1955) for the new Novice certainly gave the impression that high power was unnecessary. Mix allayed doubts about the low power rig's ability to work out by noting "*Naturally, a full-size antenna, well elevated outdoors, will bring better results, but many short distance contacts should be possible with an indoor antenna as short as five feet*". This appears to be an intentional exaggeration to make the point. In addition, other construction articles featuring simple low power units continued throughout the period to inform new Novices that high power was unnecessary. As with Mix's unit, economy, ease of assembly and effectiveness were the primary selling points.

W1TS's **'The Novice One-Tuber'.**



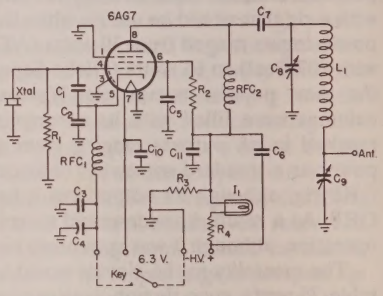
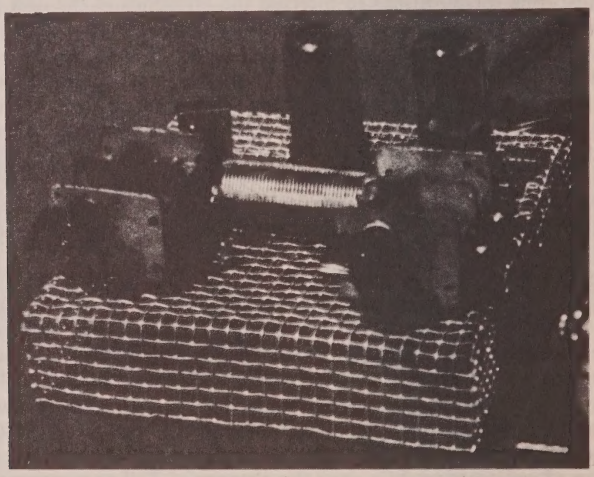


Fig. 2 — Circuit diagram of the Novice one-tuber.

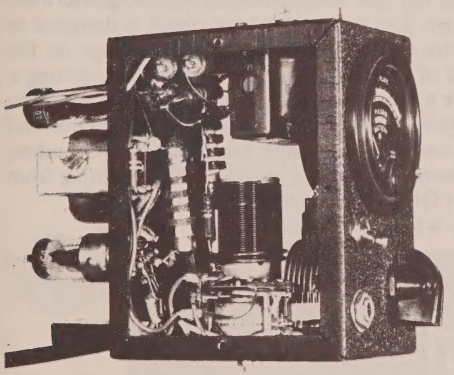
W6QXH's **'The Mighty Four Watter'.**

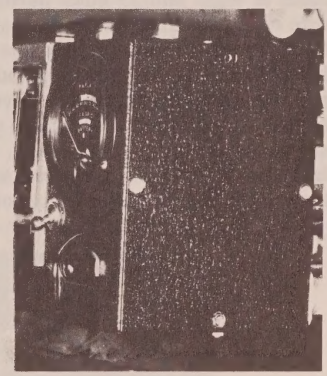


CQ for July, 1956, provides another example of the attitude which accompanied the description of these rigs. Editor Wayne Greene (W2NSD) prefaced Howard Weisberg's (W6QXH) "The Mighty Four Watter" with a header in his inimitable style: "*we hear sneers from the High Power corner -- but can they dupli-*

cate that peculiar thrill that goes with a Vest-Pocket rig Contact?" The QRP'rs rewarding sense of achievement comes through clearly in W6QXH's pitch: "*This is a Novice rig. It is not a beautiful rig, with shiny panel and knobs and fancy panel decals. But it does have features which make it ideal for the beginner, and for the old-timer with the arm-chair rig who wants to get back on the novice bands, where a contact in the next state is something to be proud of, and not just a boring interlude.*" The novel approach to chassis construction employed "hardware cloth" (1/4-inch wire screen material bent into a chassis box). The circuit uses a single 50L6 crystal oscillator with pi-network output and a 35Z5 rectifier in a power supply circuit hooked directly to the a.c. mains without a transformer -- exactly the same type of circuit seen in the 1930's. A 200-Ohm 10-watt resistor drops the 115 v.a.c. to 85 v.a.c. to power the filaments. W6QXH's testimonial struck the usual QRP note: "*Best of all, it really works! To see what would happen I put in on forty with a dipole antenna. I worked three Novices in three states, and the first station I called came back. With the feeders of the dipole tied together I worked out on 80 meters with an RST 579 report. Any novice who builds a rig like this can be sure of hundreds of contacts in many states if he tries!*" Without a doubt, teenage newcomers with little or no economic resources believed these claims implicitly and commenced scrounging around for components.

***K4ANU*'s 'Ten Watts Mobile for Twenty Bucks'.**



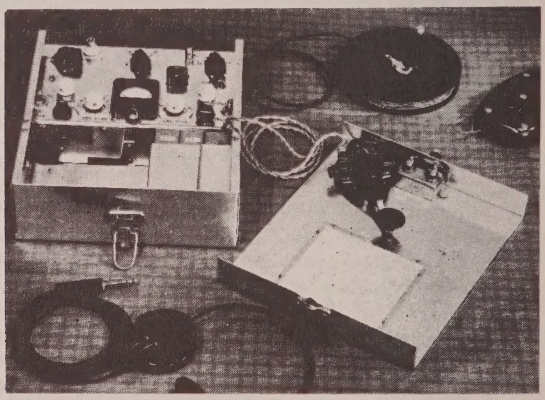


Throughout the period, the compactness required of mobile and portable equipment generated construction articles which featured low power transmitters. These were accompanied by testimonials of successes with the low power units, but usually made no reference to QRP as a way of life. In the numerous articles describing such low power mobile transmitters, the ability of low power to work out was a focal point. In a typical article, Gilbert C. Voyles' (W9THD) "A Flea-Powered, VFO Rig for 10 Meter Mobile Operation" (*CQ*, June, 1950), W9THD commented: "*This little rig is capable of giving very good results*" (including multiple DX contacts with KP4, KZ5, VE and B.W.I.) "*from average highways, and no hills or elevated sites have yet been tried*". The unit measured 6 inches square with a circuit consisting of a 6AK5 v.f.o., a 6C4 doubler and 6AQ5 Class-C final, and featured a novel arrangement for 'spotting' the v.f.o. In another article, Paul L Whitlock's (K4ANU) "Ten Watts Mobile for Twenty Bucks" (*QST*, February, 1957), K4ANU began by noting: "*In these days when the average mobile power on the low frequency bands is 50 watts or more, it may seem foolish to suggest anything at little as 10 watts. But don't under estimate the capabilities of this little rig. I have worked hams in Montgomery with Q5 reports, and that is 100 miles away.*" He stressed the economic advantage of low power

mobile since it eliminated the need for expensive power supply setups. The circuit featured a 6C4 crystal oscillator driving a 6AQ5 amplifier on the 75 meter 'phone band. A second 6AQ5 served as a modulator.

Similarly, portable rigs required compactness, a difficult assignment in the days of vacuum tubes, although subminiature and 'acorn' types permitted a modicum of miniaturization. The attractions of backpacking California's Sierra away from developed areas produced Robert W. Vreeland's (W6YBT) "The 'Mountaineer' – A Hiker's Portable" (*QST*, Sept. 1950) which included a 2-watt transmitter and a crystal controlled superhet receiver. W6YBT noted that "*although most hikers will argue that even the smallest radio unit is too much to add to the pack, few hams who contemplate a vacation trek are willing to leave all gear at home.*" The use of new midget components cut the size down to 3 x 8 x 9 inches and the weight to 9 pounds in 'The Mountaineer' – what a massive unit compared to a later 'Mountaineer' by Wes Hayward (W7ZOI)! The circuit used subminiature receiving tubes in a simple two-stage transmitter (1U4 crystal controlled local oscillator, 3A4 final) capable of two watts input, and a three-stage receiver (1R5 converter, 1U4 detector and audio). The unit was powered by a 1.5- volt A-cell and 157 volts of B-batteries. W6&BT's reasoning for the choice of 80 meters: "*Although 40 meters has a better range in daylight, 80 meters seems to be the best all around band for work in ruggesd country.*" Contacts of up to 250 miles at night and 25 miles during daylight were managed with a quarterwave wire operated against a counterpoise. The transmitter tank circuit is designed to feed various lengths of random wire antennas via several switched taps on the inductance. The suggested method of erecting the antenna is familiar: tossing a rock tied to 27-lb. fishing line over a tree branch and then pulling the wire into position. Among the hardships to prepare for: "mountain meadows produce and enormous supply of mosquitoes", and "chilly nights"; precautions: spare tubes, fuses, extra dial lights, and some source of light for logging while operating from the sleeping bag! Foreshadowing of QRP Field Days of the 1970's-80's.

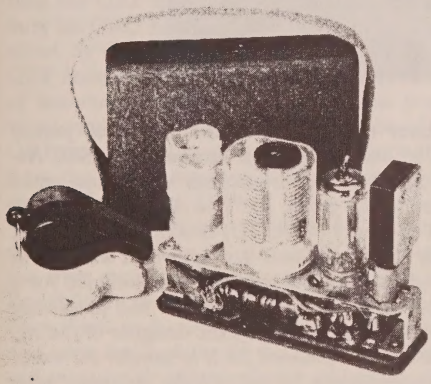
W6YBT's **'The Mountaineer - A Hiker's Portable'.**

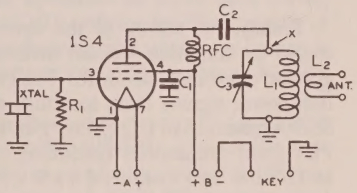


With so many hams using low power rigs, it is not surprising that only the rigs using remarkably low power merited special mention as QRP in the amateur radio literature, and these were usually presented as novelty items. One of the few such rigs featured in *QST* (prior to the advent of the transistor) as a specifically QRP unit extolled the achievement of very low power operation. The introductory paragraph of "A Bantam 1-Watter" (*QST*, January, 1948) recognised the QRP operator as a distinct entity in amateur radio in a commendatory tone:

"Ernest B. Lindsey's (W4BIW) 6-oz., 12 cubic inch, 1-watt c.w. rig should earn for him the warm approbation of the 'more miles per milliwatt' gang, that hardy breed who still successfully traffic the kilocycles, ofttimes to the utter disillusionment of self-respecting kilowatters." References like "the more miles per milliwatt gang" are found throughout the period, evidencing a common awareness of QRP. Typically, the spirit and achievements of the milliwatting QRP'r were still used here to mock the 'watt hogs' who were presented as egotistical louts and a general nuisance in amateur radio. A surplus Type BCR-746-A tuning unit was used as the chassis with components mounted in space provided by removal of original components -- typical QRP'r ingenuity: put any small (or better yet, tiny) piece of electronics into a QRP'rs hand and the wheels begin turning in the search for a way of turning it into a QRP transmitter! The transmitter used a single 1S4 subminiature tube as a simple crystal oscillator with 1.5 volts on the filament and 30 to 90 volts of B-battery for the plate supply. Output was taken through a coupling link on the plate inductance. Results? *"From Atlanta, W4BIW has blanketed Georgia and worked into Alabama with the rig. Here in Connecticut [at the ARRL headquarters, where the unit was being tested] using 80 meters and 0.8-watt input, 22 stations in 10 states were QSOed in 12 hours -- without high-powered preliminaries!"* This sounds like a misplaced entry from the 1930's!

***W4BIW*'s 'Bantam 1-Watter'.**

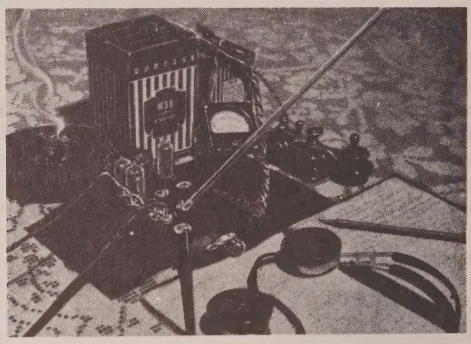




Another genuine QRP novelty rig was described in "Shack in a Wallet" in *CQ* (April, 1951) featuring a unit by W1KWU. The Editor introduced it: *"We've seen rigs built into everything from boxes to books, but here is a topper in novel construction. It's a 1-watt crystal controlled transmitter with regenerative receiver, both built into a BILLFOLD!"* The motivation for the design of the rig: *"W1WKU built it and says it not only works DX but solves the problem of what to do with the wallet he got for Christmas."* The wallet transceiver is a genuine QRP unit representing that timeless desire among QRP'rs to build their rigs into extraordinary enclosures, a desire which led to the G-QRPC's "spy transmitter" contest in 1983, an activity which produced rigs in fully functional flashlights and, in G4BUE's ingenious contraption, a 2-watt transmitter in a cigarette package. The receiver of W1KWU's unit used a 2E32 regenerative detector followed by a 2E36 and 1S4 audio amplifier; the transmitter used 1S4's in the transmitter oscillator and amplifier; both were powered by a 1.5-volt A- and 90-volt B-batteries (not in the wallet, of course). The components were mounted on a piece of masonite board,

which was then inserted into the wallet, followed by the insertion of the sub-miniature tubes; the batteries, key, 'phones and antenna were then connected, the rig tuned up, and operation commenced with 1-watt input on 40 meters. The results are impressive: "*W1WKU reports that he operated this rig for a week at Boscawen, NH last Aug, 1950. The antenna was 133ft long wire with the far end atop a light pole about 30ft above ground. Running 1 watt input on 7105 kHz after midnight, he worked a thousand miles into the W4 and W0 zones.*" The Editor made the typical observation about QRP operation: "*Maybe this again proves that good operating, the right band conditions and patience are just as essential to working-out as is high power.* "

***W1KWU*'s 'Shack in a Wallet' 1-Watt Transceiver.**



Finally, no survey of the low power transmitters of the 1945-1960 period would be complete without mention of one of the most famous, the "SSB Argonaut", the inspiration for TenTec's classic QRP transceiver which now emits flea-power signals from locations around the globe. In "The Adventures of the SSB Argonaut" in *CQ* (May, 1960), Ted Henry (W6UOU) described the 35-watt PEP s.s.b. transmitter (including 110/220 v.a.c. power supply) which weighed in at 11.5 lbs. and measured 6 x 9 x 5 inches. The unit was specially designed for a globe-circling DXpedition to locations where no s.s.b. operation had previously occurred. This gave W6UOU and Bob Adams (W6AVA), the designer of the rig, the inspiration for the name: "*Inasmuch as we planned for it to wander the world seeking the 'Golden Fleece' of DX communications, we called it the 'Argonaut' after the mythological gold seekers of ancient Greece. Apparently the name was well chosen since it has figuratively struck gold in every country it has visited. And already it has wandered so far it has dwarfed the puny voyages of the original Argonauts.*" After the last solder joint cooled on July 23, 1957 [*R12 S.S. Nr.: 191*], W6UOU and W6AVA put the rig on the air for its first test for a "*long and highly rewarding evening*". Indeed! "*Some three dozen QSO's later at 0200 we closed down knowing that 'Argonaut' was a success. We had contacted amateurs in 7 countries including such DX countries as ZL3DX, VK3AEE, KA0SC and DU7SV. Reports were all Q5 ranging from S-5 to S-8.*"

The subsequent wanderings of the Argonaut were highly visible testimonials to QRP operation as the rig became a legend among DX'rs. In its maiden outing on Canton Island commencing September 2, 1957, KH6KS/KB6 gave 200 stations their first KB6 s.s.b. QSO on 20 meters during his off-work hours. From there, the Argonaut moved to KS6, VR2, VS1, VS5, VS6, VK9 and many other DX spots. In many cases, it was operated not by W6UOU and W6AVA, but by local DX'rs to whom the unit was shipped. Their reactions to the performance of

the original Argonaut foreshadowed the reception given its later offspring, the TenTec Argonaut: "*Every operator who has used the rig has marvelled that this little insignificant bit of nothing can talk so far with such a big voice!*"

The significance of the Argonaut and other QRP rigs like it is that they, more than anything, showed the world what could be done with QRP. As in the late 1920's, during 1945-1960 QRP ironically received its greatest public exposure in the midst of KW territory -- the world of DX'ing!

III. QRP'rs in KW Country

"...It certainly did a good job for its size.
We usually think of the W's as having the full gallon or at least a mighty job..."

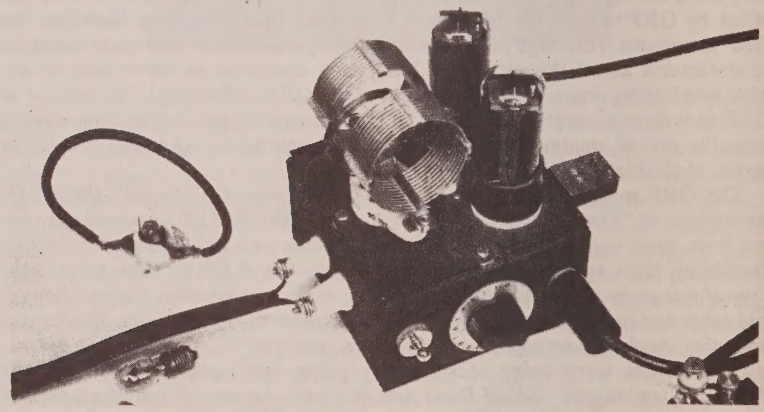
Being a genuine QRP'r requires a self-awareness that one is running QRP because of an acceptance of the challenge, limitations and rewards of low power. The individual who is successfully running a 6L6 oscillator and reaping the rewards, but who sees it only as a stepping stone to 'real' hamming with QRO, doesn't really have the QRP spirit. The understanding and the committment are lacking. The QRP spirit flourishes out of the basic realization that with skill, low power is enough to do it. Commitment to the challenge and the rewards is the next step -- to go for the thrill of doing it with flea power. But the final step is the lowering of the cornerstone on the grave of the illusion that hamming will improve with an increase in power. Once that illusion is solidly cemented into a tomb, then the QRP spirit can blossom. This does not mean that the true QRP'r must bury his QRO rig along with that illusion. He just recognizes it for what it is! The effort by QRP'rs to teach radio amateurs about this philosophy identifies the QRP movement. Although the literature of the period offers numerous examples of statements about the success of low power operation as we've seen above, what was lacking was a full ennunciation of the QRP philosophy. The concept of QRP as a chosen mode of operation with an underlying philosophy separating it from the rest of amateur radio surfaced in two articles in *CQ* in the mid-1950's about, of all things, DX'ing!

The QRP spirit burst forth in full bloom in Howard C. Buerger's (W3QBU) description of "The Lil' Rig" in *CQ* for August, 1956. W3QBU covered the subject from many angles in promoting QRP operation as a viable mode for DX'ing. Portability, then as now, was cited as an advantage of QRP: "*Going traveling? Even if you go by plane, you don't have to be without your hobby. Pull out the coil and tubes and tuck the 4 x 4 x 2 inch rig in any corner of your suitcase. Slip the coil and tubes inside of your slippers and you're on your way!*" The notion that operating advantages were being sacrificed by going low power was rebutted by W3BQU's testimonial: "*Wait! Don't turn that page. Let me tell you about the DX this lil' rig has worked, consistently too. I've QSO'd ZL2SX seven times during this past year. Received lots of S7 reports in most of the 53 countries that I've worked in the past two years [R12 S.S. Nr.: 1954, 6-12; 1955, 14-81]. Yes, WAS and WAC too. This all was achieved while operating portable on a job assignment down in Texas.*" To add to the evidence, Buerger cited comments from DX'rs he'd worked with the rig: "*Here are some interesting comments by a few well-known hams that you've worked yourself. 'It certainly did a good job for its size. We usually think of the W's as having the full gallon or at least a mighty job when compared with our limit of 100 watts' says VK2ZR. And from ZS1G, 'That small rig of yours certainly does the trick.' 'U are doing a FB job wid tt low powr, Howard, congrats' said CX1FB. From GI3IVJ, 'Ur small TX doing vy well'.*" The strange notion of running QRP during the DX contests rounded out the testimonials: "*And KR6LJ was worked during the DX contest. He said, 'No doubt the lowest power I QSO in contest'.*" The Lil' Rig was not simply a novelty item brewed up for a lark. W3BQU had been

operating it for 15 years, during which time he'd only blown two tubes, which probably just wore out!

The circuit itself is quite simple and makes the most of the 117L7GT dual section beam-power tetrode and rectifier tube. A pair of these were configured as a push-pull crystal (14 MHz fundamental crystal) oscillator which cancels out even harmonics, minimizing TVI. The rectifier sections of the tubes were used in a voltage doubling circuit connected directly to the a.c. mains without an isolation transformer. In contrast to earlier circuits of this kind, this particular circuit isolated the a.c. mains from the d.c. circuit, thereby eliminating the possibility of a.c. voltage shock, and the extra precaution against d.c. voltage shock was added by isolating the B- voltage from the chassis ground. W3BQU estimated 18 watts r.f. output from the transmitter by the most common method then in use: "*When all tuned up and feeding the antenna, the tubes draw 120 ma. at 200v. With this 24 watts input the lil' rig lit a 15w bulb to more than full brilliance in a dummy antenna circuit*". Note that this would amount to an efficiency of 75%! Actually, it probably was considerably less. What W3BQU and the rest overlooked was the dynamic r.f. resistance of incandescent bulbs in estimating r.f. outputs by this method. Nonetheless, 18 watts output, real or illusory, was QRP enough in the context of the DX results cited by W3BQU to create the impression that DX could be worked consistently with QRP. This is especially true since the 53 countries were worked with a folded dipole antenna.

W3QBO's **'Lil Rig' with pair of 117L7GT's.**



In the true QRP spirit, W3BQU built his successful operating techniques around an apparent limitation of the transmitter: "*Rockbound! Yes, but not a disadvantage -- actually a blessing in disguise. With a handful of surplus crystals and being able to QSY almost every 5 or 10 kc in the desired portions of the band, you will benefit by this when working DX. By not being able to zero beat the DX station I have lots of times walked away with the prize while the gallons fight it* out." Transforming limitations into advantages is a constant part of the challenge in QRP operation. The payoff of persistence and strategy in QRP operation: "*And what a thrill to do it with flea power!*"

W3BQU emerged as something of a QRP crusader in the concluding paragraph of the article. He had apparently been discussing the possibility of popularizing and organizing QRP activity with other hams, particularly W2ANR, another QRP'r. The latter wrote to W3BQU that "*I sure do get a kick playing*

with low power rigs and trying new things", two factors in every QRP'rs experience. W2ANR's thoughts on a strategy for popularizing QRP echo the theme sounded by Handy and Battey: "*OK on that low power movement, Howard. First we must get a few interested in it by showing what can be done with low wattage.*" Unfortunately, nothing seems to have come of the W3BQU and W2ANR planning. Like their predecessors who publicized QRP operation, W3BQU and W2ANR assumed that QRO operators would automatically respond to the challenge and thrill of QRP: "*Low power CAN become a fad because it makes the individual feel important by frequently duplicating what the ham with the 500 watts or KW can do!*" They failed to see the reality – 'clearing the frequency' with a KW also creates a sense of importance, or, W9DZG's QRM-free 'intelligent chats' are something that 'mouse powered toys' can't duplicate.

The QRP philosophy came through even more distinctly in an article a few months later in *CQ* for October, 1956. In a classic entitled "You Don't Need A Kilowatt", Mickey Unger (W8YIN) took over Kruse's role in lambasting the KW 'watt hogs' of the 1950's while offering several pages of 'how to do it with low power' advice about operating strategies and techniques. While W8YIN didn't define low power precisely, he clearly had in mind anything in the under-fifty watt class. His ideal is the QRP DXer all the same and the article was slanted to the newcomer to QRP DX'ing, including real newcomers and converted QRO DX'rs. In the humourous introduction, in fact, W8YIN presented the QRP DX'r (himself in this case) as a HERO in the mock-epic tradition: "*Having just waged the Battle of VR1B, the desire to speak is rampant in my breast, and it must be done before pinning this Purple Heart next to the others encountered in the Battles of YA1AM, AC5PN, FS7RT, LU3ZY, etc.*" To balance out this description, Unger portrayed his successful KW competitors in a sarcastic vein as they celebrated: "*We glow and shimmer with the thrill of THE NEW ONE and immediately begin playing the Souza March:*

Hurrah for my beam and my kilowatt,
I just worked another new country!

Of course, W8YIN had just worked it with his QRP rig! He ridiculed the KW as cumbersome and inflexible, requiring careful retuning when moving from one end of the band to the other, a necessity which gave the QRP'r his needed edge: "*many a time, a flexible peanut whistle will swoop down on the prey before the KW boys have tuned up. Have you ever been listening on twenty to the gang trying to work AC5PN on the high end? When FB8ZZ fires up on the low end, it's just like Daytona Stock Car Track as the carriers come roaring and hurtling down the track. And what do the KW's find when they get tuned up on the low end? Firey red tubes and W2QHH (see DX notes below) working FB8ZZ! Low power has its advantages and this is one of them.*"

Aside from the potshots at the KW gang, W8YIN provided a comprehensive collection of hints about QRP DX'ing, all of which are currently espoused by QRP DX'rs and have been discussed in detail in *The Joy of QRP* and other QRP publications. Patience, the key virtue of the QRP'r, must be complimented by realistic expectations: "*About half of what you call is a good average, even for a KW. Some fellas settle for 5 or 6 DX QSO's per log sheet [at the time, all calls had to be logged], and they are realists, not pessimists. So make up your mind that you won't work em all and don't fight it.*" Furthermore, thoughtful preparation increases the chances of success with QRP: "*Regarding power, most experts on the subject will tell you that fifty watts will do the job of 500, if conditions are right. And you can do a great deal to make conditions right.*" Leaning toward the exotic in regard to the key component of any QRP station, he advised rotary beams on 20, 15 and 10 meters, but in any case, "*make sure that whatever you put together is, in*

fact, an efficient system." V.f.o. control, break-in, and the ability to quickly shift antennas for band changes were a "must".

The overall strategy suggested by W8YIN was to 'Use a DX plan' for picking operating times, bands and directions to work. A novel aspect of W8YIN's DX plan was intended to preserve psychological stability and consisted of doing 'routine DX'ing' on even days of the month and ignoring the tough stuff, even "*when your buddy down the street calls you on the landline to tell you about the VU5 that's coming through on twenty*". No, the even days are for enjoyment. The odd days, however, are the time 'to be a maniac': "*Gnash your teeth, grind your knuckles, kick your children in the slats, and go after the elusive stuff. Tune 20 c.w. first; then the rest of the open bands, until you run across a new one. Then, bring all your DX artillery into range until you land him.*" Tuning across the band with the r.f. gain backed off is a "*rapid- fire method of determining when a rare catch is on the band*" -- just "*listen for the biggest mess*" and if a new country is at the bottom of the pile-up, "*you need not tune further. This is your hangout for the next few* hours." Persistence will payoff.

W8YIN stressed that the foundation of planning for QRP DX'ing includes studying about propagation. Knowing where and when to hunt depends upon being a good prognosticator: "*it's essential that you have an understanding of propagation and a working knowledge of what to expect on each DX band at any given* hour". W8YIN's on the air 'tricks of the trade' included a familiar list of QRP operating strategies: piggybacking DX QSO's; eavesdropping the well-known DX'rs for information about who, where and when; scanning the band carefully for new prefixes; listening; sliding 2 or 3 kHz off the center of a pile-up, or waiting until it "*has abetted to a small roar*" before calling; either "*work a DXpedition in its first hour or wait until the last day*"; make DX calls short and keep trying; follow instructions from the DX station for responses; observe the DX station's habits and adjust to them; use break-in. Mickey Unger's discussion, despite its more flamboyant aspects, presented a body of solidly reasoned advice to the would-be QRP DX'r. That W8YIN's advice was so salient should come as no surprise, since his low power savy was built up in the process of racking up 263 countries, 143 on sideband! "You Don't Need a Kilowwatt" remains worthwhile reading for the QRP DX'r even today.

QRP also received publicity in another unusual place. Rod Newkirk (W9BRD), longtime 'How's DX?' columnist at *QST* regularly included 'QRP tidbits' in his packed monthly surveys of DX activities beginning in December, 1947. He appears to have been the only staff member who continued the tradition of the 1920's and 1930's in regard to supporting QRP. The world of DX'ing was then as dominated by high power as it is now, and comments like "*W9EU's 250-watter continues to hold its ground against the gallons*" by Newkirk frequently pitted the rest of the world against the KW's. Imagine the impact on readers who went on to stumble across a QRP DXploit after the sympathy shown the 250-watter! In the midst of his annals of the battles fought and lost against the KW's, Newkirk periodically reminded the DX gang about the successes of QRP DX'rs (and continued to do so up until a few years ago). In the March, 1958 issue, an occasion was furnished for such a comment by the upcoming ARRL DX Contest and the fact that "*Our 28-Mc band's present ecstatic status is bringing QRP back to DX fashion in the ranks of the sleepless.*" The phenomenal DX conditions produced by sunspot Cycle 19, just then passing its peak [*R12 S.S. Nr:* 201!], were responsible for the resurgence of QRP DX'ing and Newkirk noted the effect on his job as columnist: "*The monthly mailsack affords ample evidence that never before has so much DX been worked by so many DXers with so little I-times-E* [*i.e., power formula: W = I x E*]". From his vantage point, he apparently

believed that the achievements of QRP DX'rs were reaching new heights in regard to what QRP could do.

A glimpse into the then-current understanding of the loosely-used 'QRP' is provided by his comments on this "controversially relative term", since 100 watts "*can be subliminal QRP*" in the mind of the KW'r and a 10-watt input "*outrageous QRO so far as the contemporary transistor-rig fan is concerned*" [this latter perception reflects the extremely low powers obtainable with transistors at the time as noted in Chapter 11]. Newkirk's survey of the opinions expressed in correspondence led to the conclusion that "*something under twenty watts input is generally considered to be noteworthy QRP for W/K/VEs in pursuit of DX.*" Bearing in mind that the input power used at the time should be derated considerably in order to convert to output power, Newkirk's location of the QRP power level at 20 watts input approaches the current 5-watt QRP level and allows us to appreciate the QRP DX'ing achievements which he frequently listed in 'How's DX?'.

W9BRD walked a tightrope between his obvious longterm admiration of QRP DX'rs and the need to remain neutral as a *QST* columnist when he confronted the philosophical issue: "*No--we don't hold, as do some, that the use of such low power is necessarily a virtue ... [it] may be more sporting, but no more* righteous". The recognition of QRP as distinct segment of amateur radio comes through in Newkirk's reference to the rewards of QRP DX'ing: "*few will deny that QRP can be a gratifying and highly specialized approach to DX kicks*", adding in his inimitable, witty style that QRP DX'ing is "*a gay gamble against stacked* odds". The upshot of his discussion was an invitation to QRP'rs to continue submitting results to 'How's DX?' since "*even high-power men occasionally confess to keen interest in their derring-do*". No doubt W9BRD himself was such a one! His level of "keen interest" showed through when he closed with a note of encouragement to enter the 24th ARRL DX Contest directed at "*W/K low-power code entrants who are inclined to be driven underground by the opening Test weekend's brutal barrage*". Many high power readers must have thought W9BRD had finally succombed to the stacks of mail and lost it! He could not have foreseen the day when separate sections of the ARRL and *CQ* DX contests would be devoted to QRP entrants and incredible QRP records set in one contest and bettered in the next.

Beyond his occasional editorializing, W9BRD's efforts at giving QRP 'equal time' in 'How's DX?' must be commended as an important historical contribution, since the column provides the most detailed record of QRP successes during the 1945-1960 period, and, when combined with the material found in *CQ*'s DX column, constitutes the bulk of the material published about the subject. He continued to give encouragement and recognition to QRP DX'rs through the 1960's and 1970's, and is sadly missed. We now turn to the annals of QRP DX'ing assembled from those sources in order to grasp the achievement of QRP operators in the homeland of the KW.

IV. How's *[QRP]* DX?

"...Phooey! If you want, I'll send a copy of my log for October 16th which shows QSOs with not only 9 Gs, but also I1BN, HE1CE, F8AT, PA0AAT, GM2ADT, ON4HB and OH1W. All this with 15 watts and from San Diego yet. Better W5CXS should use his five-element beam for a rotary clothesline..."

An entry for January, 1947 (*QST*), provides a nice transition from the early DXploits of the 1920's and 1930's to those of the 1945-1960 period. Rod Newkirk (W9BRD) reported: "We had to look twice at the dateline on his letter, but W2BSR told us about LZ1XX, EL3A OX1BC and VQ2 he worked, among other

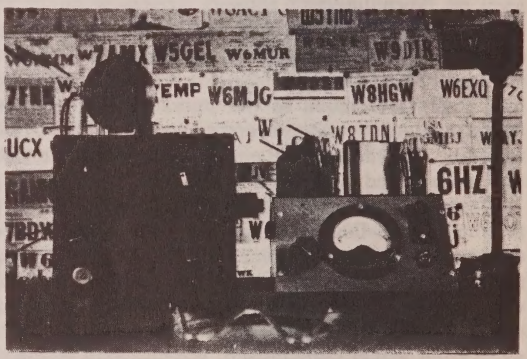
recent DX, and then went on the describe the rig. *Artie uses a 203A in High-C Hartley circuit, a detector and one audio Type 30, and a pair Murdock 'phones bought in 1920!*" QRP DX'rs undoubtedly will be interested in perusing the following clippings from the DX columns in *QST* and *CQ* for 1947-58.

QRP DXploits for 1947

(R12 Sunspot Nr. Range: 132-152)

The boys are having a good time on **80 c.w.**, this being the season for foreign DX on that band. -W2QHH got ON4AU, G8TKL, G6RB, and G6ZO with only 20 watts. -W1DDO sticking with 80 meters grabbed OK1VW who was using 5 watts at the time. -The 25 watts at W2EQS worked 9 countries on 80 meter and 36 on 40. His all-time total with low-power stands at 71. -The DX is good on **7-Mc.** for those willing to dig a little. -W3GNW snagged OK1FF with only 30 watts to a crystal oscillator. -W1MDF with 25 watts lists 28 foreigners worked on 7-Mc. -W4LAC using ten watts on 40 had a fine contact with ZL2KM.

-The 40 watts at W2QHH is still getting out nicely on **20**: VK6SA, OH2PK, VR5PL, ZD2Y and VK4BI plus several Europeans. - W6MHF's 10 watts and 8-element (!) beam grabbed NY4AE, NY4CM, ON4GU, G2DM, VP9T, LU7DN, ON4VU, J3AAE, VO6U, ZK1AV, FA8BG, PA0CE, VO2R, CE3DZ, G3LR, G5SR and G6QB. -VK2CI, after years of trying, finally worked WAS using 24 watts and a tilted Vee beam, the apex being 40ft high and the ends being tied to fenceposts. -On 20, W3LCV didn't need more than a 6L6 at 10 watts to work G2PN, G5XW, EI9N, CN8EG, and VO4J. -Still running 10 watts to an 8-element beam, W6MHF toddled off with CN8EG, J9SIR, VP4TAA, ZE1JI, J8AAI, ZD4AB, VR5PL, KP6AB, CN8BK, and KX6USN. (What is the 'countries per watt' record anyway!).



WAC with less than one watt. *Behold the station of R.J. Whyte, VK2AHM. The HY60 final runs cool with 160 volts at 5.5. ma. on the plate. On 'phone, a 1J6G is used as a Class-B modulator.*

-VK2AHM's one watt WAC included W6VDJ, VS1BG, ZS2AL, G5RF, ZL4AO, and CE1AH (We said ONE watt!). -XABX, Athens Greece: At present, he uses a 6.5 watt German tank outfit, and when he pushes the QRO button, it jumps up to 10 watts. -W6NIH doesn't think too highly of W5CXS and his bid to fame on working 9 Gs and "other locals" on 125 watts. We quote: "Phooey! If you want, I'll send a copy of my log for October 16th which shows QSOs with not only 9 Gs, but also I1BN, HE1CE, F8AT, PA0AAT, GM2ADT, ON4HB and OH1W. All this with 15 watts and from San Diego yet. Better W5CXS should use his five- element beam for a rotary clothesline". Now fellows, please.

-G2AXG recently worked W6FMO, who was using only two watts. G2AXG, however, was really QRO using 3 whole watts. The QSO was on the **28-mc** band. -ZD4AB (Gold Coast) had been giving lots a people a new country with his 25

watts into an 807. -ZB2B using 807 at 20w apologizes to W6/W7 DX'rs for not answering their calls because of EU QRM. *-J9ABX (JA) said he was working ZS6BW who told him his power was 4 watts. J9ABX told him this was entirely too high and should cut it down. So, he did. He wound up using a Vibropak putting 100 volts on the plate of the final tube and drawing 9 ma. This was on 10 meters, and he was 58 at J9ABX.* More power to him [*eh?*]. -On **10**, W9AWO's 19w to an 807 snagged KZ5NA, HP1A, PY6AV, FA8TX, PZ1RM, VO6H, TI2EA, and HC1FG. -VQ4MNS is returning to England where he will resume G2CKM. In Kenya he made some 400-odd contacts with his 5 watts on 28128. He expects to go to ZE1 in about a year.

DXploits for 1948

(*R12 Sunspot Nr. Range: 149-135*)

-W2QHH has been running about 12 watts input on **80 c.w.** and has over 2 counties per watt on the band. Some of them: ZL1CI, V02AH, NY4CM, KP4KD, GW8CT, GI3FL, F8BG, F8EX, PA0LB, HB9EO and a carload Englishmen. -35 watts on 80 meters at W2OAR beeped through to G5LI, G6ZO and a few more. -A report from G8JT via W1QMI comments upon working working W7KVU while the latter was just running 3.8 watts on 80 c.w. -W3JAK had 25 watts into an ARC-5 on 80 c.w. for PA0EP, ON4QF, G6ZO, HB9FF, FA8BG, FA8IA H and KS4AH. -G3AGQ normally uses 50 watts but has fun with a 7C5 at 6 watts when conditions are right on 80 c.w. -W2QHH is still gunning for 3.5-Mc stuff with his 17 watts. He has over 30 countries and 5 continents so far. -The 6L6 at W7JGU blasted its way on 80 c.w. to KS4AF and XE1DX. -W1MEG's 30 watts accounted for G8JR and PA0NG on 80 meters.

-10 watts to a 6L6 on **40** also gave W9MFY a solid ZL3FP QSO. -A 6L6 crystal controlled oscillator popped the buttons off W3GNW's chest by raising G8PT on 40 c.w. -W8YGR's 23 watts got responses on 40 from CM2JF, CM2FR, KZ5NG, G3AAB, F8EO, G4RJ and G5HH. -Claiming that his 7-Mc. antenna practically scrapes the ground, W2TRB nevertheless put his 35 watts to work on VK2SS, GI6TK/A, F9EZ, GM3BCD and GM3AWF. *-KH6PT blew up his power supply and was so disgusted he hooked a 90-volt B battery to a 1S4 crystal oscillator to see if he could scare up another KH6 lcoal to tell his troubles to -- but W6ZMU was there to answer his 1.62 watt CQ on 40 meters. -W6ZMU had only 35 watts, so it looks as if the days of QRP aren't over yet.* -The 6L6 at W5ONL surrounded KL7HI, CM2GV and VK3QH on 40 c.w.

-W1EYP seems to be astounding a lot of the DX stations when he tells them he is only running 20 watts into an 807. He operates 10- and 20-meter c.w., and has 62 postwar countries. His antenna is a vertical folded dipole starting 4ft off the ground and running up the side of the house. His 20-meter antenna is a 33.5ft off center fed semi-vertical. In exactly one year's time, he has contacted 398 foreign stations. -Have you worked EP3H. If you have, don't worry about him, he is very much okay. The station is operated by Phil Williams, ex-G3LK and VS1BZ. He is running only about 14 watts into an 807, and it's **20 c.w.** only. The antenna is a modified 8JK. -FE8AB has sent in his list for the Marathon. He was originally F3AT, and in Jan., 1947, he left home with a portable rig which used a 6L6 in the final running 20 watts input. It wasn't until June, 1947, however, that he got on as FQ3AT. He got a big thrill out of his first CQ, because he found many stations calling him (many is certainly an understatement!). Of course, he was the first FQ station on the air after the war. In November he left FQ3 for Douala in French Cameroons. He was on the air there January 1, 1948, signing FQ3AT/FE.

-W2QHH's 40 watts is still is at it on **20** meters. We mean a 1-day WAC and contacts with XAFQ and KA6FA to give Howie 102 postwar. *Sensational QRP DX is nothing new for this guy--you will remember him as prewar W8JIW with a*

17-watt DXCC. Furthermore, he doesn't lean on a VFO. Not bad for an amateur! -An interesting epistle from VS9ET states that so far he can only pull W6's through out there. But Eddie also complains about the pileups. His Vee keeps raising stuff in odd directions, furthermore, while being arrrowed toward G. 10 or 15 watts to an 807 gives him the push. -W4LWP's 25 watts didn't shy away from CM1AU, KM6AA, CR6AI, CT1PP, VP5AK, HH3L, PK6SA, CE3BA, TI2BF, VP2AA, ZS1EJ, ZS6LW, OA4BR, and a truckload of VKs including 9OU, 9RF and W0TKK/VK9. P.S.: The 807 was doubling from 7-Mc.! -Going to higher power on 20 meters from one to 20 watts gave VK2AHM pleasant sessions with SV1RX, VR2AU, UJ8AD, UD6AC, UA0SG, MX2A, FA9JB, PK6XA, CR7VL, ZK1AE and MI6AB.

-W7EYS has heard KA1CB on **10** phone, and he was running 200mw. This enormous power is on a couple of acorn tubes in the final. W7EYS is wondering if KA1CB has to step the audio up or down from his mike to the modulators. -LU8BF specializes on 10 meter 'phone DX. He is one of the QRP boys running about 60 watts into an 807. With this he has worked about 15 states. -A halfwave and 20 watts on 10 meters were sufficient to enable W1NKW to be palsywalsy with GI2AFW, GW8NP, GM3AKK, D4AVN, HB9HE, OZ3M, OZ4PB, PA-0AD, XADW and ZS1T on voice.

Feature photo: "Here's the layout at VR2AQ on Fiji operated by J.W. Holden. The transmitter, a 20-watt job is above the SuperPro and there's a borad-band converter above the speaker. VR2AQ is one of the more active Fiji stations on 28- Mc" (*QST*, September, 1948).

QRP DXploits for 1949

(R12 Sunspot Range: 137-118)

-4X4CJ, ex-ZC6AA, is a QRP man and loves every minute of it. He runs 6-watts input to a 6V6, while the receiver is a two-tuber. The antenna is a 33ft Windom. Since April of this year (1949), he has worked 49 countries, and is all for rounding up the QRP men to get together and exchange data. He is also suggesting that the boys throw away their power amplifiers, beams and super-duper receivers and go QRP. Don't see anything wrong with that suggestion for those, that is, who agree...

-W2QHH's 17-watt 6L6G now (February) has 41 **3.5-Mc.** countries by way of VP9U, EI9J, FA8BG, W7KPA/VP2 on Antigua, LA2UA, HH2BL, KV4AA and VO2VL. -W2QHH recently had his WAS endorsed for four bands and his 6L6 now (May) has accounted 50 3.5-Mc. countries. -W9PNE claims to a 77-6J5 battery blooper receiver for 80 and has little trouble completing his 3.5-Mc. WAC with same plus 200 watts (*tsk-tsk, Brice*) to an 8005. -W2PEO is getting a bang out of 80-meter DX with QRP having worked ZC8PM and FA8BG as well as numerous europeans. He is running about 50 watts input. -W2OWX has 35 watts on **40** c.w. and raised LA7Y, OK1SX, PZ1WX, VP2TR, VP6SJ, VP9CC and CT1FP. -25 watts on 40 c.w. at W7MGO knocked off ZL/VK gang with ease, interspersed with folks like VR2AM, HC1JB, UA0FB and JA2AZ. -KL7RZ estimates four watts output on 7-Mc. from a VFO and works VKs, ZLs, UA0FB, JA3AA, and KP6AE. A Windom antenna must be the secret. -JA2BQ found UA0FP, LU5IA, HC7KD and KA7RZ using 7-Mc. and the latter was barreling through with 4 watts to a 6AQ5.

-On twenty, W1KMI worked VQ4RF, the latter perking with a mere 2 watts input. -W2QHH reeled in ZC8PM, VP8AK, VP8AP, VP8AM, VS6AE, VS6BA, ZS3D, ZS3B, W7KMV/Iwo Jima, UC2CB and C7AT which helped make up two more 24-hour WAC's for Howie's 35 watts. -30 watts to a 6L6 on 20 c.w. didn't keep W5OYD away from KV4AA, HC1JW, YN1LB, VO2RF, and ZS6GI. *The gang around Seattle is relieved (February) since W7BE left the vicinity in favor of*

KH6. Bill is having great fun as W7BE/KH6, having bowled over 40 countries through use of a ten-watt VFO and a dipole in just over two weeks of operation. -A card from W7BE/KH6 (March) agrees with KH6PM that Hawaiian conditions are inspiring. Bill's 10-watt VFO unit has over 55 countries already pinned down on 20 meters. -VQ8CB uses 35 watts to an 807 modulated by 6V6's, an SW-3 receiver and an 80 meter halfwave skywire. Power is obtained through a rotary converter running off 12-volt batteries. -VQ8CA in the Soloman group has been recently put of the air by way of a 10-watt 6L6 operating mostly around 14050. -Hooking his 7-watt VFO to a half-wave vertical on 20 enabled W4IYT to raise VP1AA, KV4AA, HH3L, PZ1FM, VP4TT, YS1ZG, TI2DL and upteen VK/ZL's.

"The QRO specialists can see little sense in hunting big game with a bow and arrow, and the QRP enthusiasts consider it poor sport to go deep-sea fishing with a depth-charge. We're neutral, of course. But KA6VP is getting a large charge out of running 10 watts to a longwire on 20 c.w. for a total of well over 80 countries. These include such niceties as ZD9AA, ZS9D, ZS3B, UL7BS, AC4RF and EL3A. Bill expects to unpack his beam shortly and should have little trouble accummulating a really QRP DXCC at his present rate. -K2BG got only as far as a 6L6 buffer stage while constructing a new rock-crusher because he had so much fun raising some 30 countries with 15 watts. So QRO is QRX. -TA3AA's postman's holiday to Iraklion as SV6AA is now history. Jules' little personal Field Day was good for 55 DX contacts and all W call areas save W7 were worked. For his next sterling performance, this accommodating gentleman plans to feature a session on Kiosk Island in the Dodecanese group. That will be as SV5AA no doubt. W8DHC and W1HX were SV6AA's first and last QSOs and he used ten watts plus a 2-tube blooper receiver.

[*QST*]: "Space restrictions cause the necessity of boiling down VQ2DH's unique account of his jaunt to Nyasaland as ZD6DH, but here's the gist: 10 to 15 watts input was run to a 6L6-6L6 exhaler on 14085 during a good part of his 7-day stay Chileka Airfield near Blantyre. A folded dipole and a modified BC3-348 aided in collecting 212 contacts with 27 countries on all continents. Conditions were quite poor generally, but on any future excursion of the kind, Bunny intends to give the 28-Mc. constituents a break." [*CQ*]: "From August 12th to the 19th, ZD6DH at Chileka Airfield in the southern part of Nyasaland. Bunny's main regret is that he couldn't have stayed longer to give a ZD6 contact to a lot more of the gang. He used to think signing a VQ2 call obtained pretty good results when tossed out with a CQ. But he says you only need to whisper a CQ and sign ZD6 and the whole band collapses on you. The rig he used was a simple affair with a 6L6 xtal osc. and a 6L6 PA (so-called). At first he was running ten watts input, and then something blew up in the power supply, thereby by raising the high voltage. He was then QRO with 15 watts! The antenna was a folded dipole of 300-ohm tape; one end being 40ft high, while the other was 30ft. In all, Bunny spent 19 hours and 33 minutes on the air contacting 212 stations in 27 countries. Bunny regrets not being able to take care of the 10 meter gang, but if he goes to ZD6 again, he guarantees he will be on 10 and 20 c.w. and phone."

-Horace, W1AB, claims the blow of the month to be when VR2BH came back to him on 'phone and said, "Glad to QSO OM. Heard you in there with the rest of the low-power boys. I know how it is OM. I only have 25 watts here myself." -CE7AP on Tierra del Fuego, Chile is very QRP as the transmitter consists of a 6L6GA with 3.5 watts input. His source is a 12v storage battery. He operates on 7006 and 14010. -W2RRT runs 6 watts input to a Signal Shifter, and this in turn coupled to a folded dipole. With this QRP on 20 meters, he has worked SM7FB, GM4HZ, HB9BX, G3CFW, CO1MS, and F9PC. -4X4CJ (ex-ZC6AA) writes of his successful use of only 6 watts input to a 6V6. In a few short months, he's

worked some 50 countries while receiving with a one tube (6C8G) blooper. The skywire is a 33ft single wire fed job.

-VK9NR having finished his Norfolk Isl. assignment is hoping to sample conditions in Fiji during his next sojourn. Noel's activity was hampered by lack of a.c. power which resulted in his being on the air for just an hour or so per day. 87 countries and a host of W's were contacted with the 6V6-807 transmitter running 20 watts, battery-powered, while the receiving was handled by an HRO with vibrator supply. The favorite skywire was a bi-square, badly hemmed-in. As you know, VK9NR is with the Civil Aviation Department. He has been using an 807 in the final with about 10 watts input and an HRO. His antenna set-up is a bi-square beam.

-A note from CE7AP was very welcome and Bill says that with the arrival of his XYL and the junior YL, the available DX hours have slackened off. However, in the two months of operation he has worked 23 zones and 33 countries and expects by the next issue to have pushed his way into the Honor Roll. He located some more storage batteries and now operates with power between 3.5 and 13 watts on 14012. The rig consists of a 6V6GT xtal oscillator and an 807 amplifier. The antennas are two longwires, one of them being half- five waves in length, while the other consumes 14 half-waves of wire.

CQ (August, 1949) noted the failure to include the score of Rick Meunier, ON4QF among the outstanding c.w. performances in the DX Contest Results. He had the sixth highest score in the world. The transmitter used at ON4QF during the contest ran 27-35 watts input on all bands and fed into a 330ft longwire as radiator. -15th ARRL DX Contest Phone Results: 2nd highest foreign score was entered by Vernon Scott HC1KP. His logs give the power output of the transmitter at HC1KP as a mere 25 watts.

Feature photo caption "Excellent results with low power is the forte of Dr. Constantine Feruglio, I1VS, of Udine, Italy. His 35- watt 28-Mc. 'phone has accounted for some 100 countries worked and 80 confirmed employing dipole antennae while the inhaling is done an S-20R" (*QST*, February, 1949).

QRP DXploits for 1950

(*R12 Sunspot Range: 115-172*)

The QRP department this month is headed by W1MWK who raised F9YK, XE3K and two Gs while running 0.9 watt to a 50B5 final on 7100 kc. The antenna (?), sure, an end-fed fullwave. -JA2FM was frolicking with 5.25 watts input when he decided to try a little QRP work. After working LU5AQ (near the antipodes from Tokyo) with the 5- watter, Cal shrunk things to around the 1 watt figure and raised VK3FH for a 569. Successive decreases 0.18 and 0.0468 watt produced reports of 559 and 549 respectively over the five-thousand mile path to Melbourne. The skywire was a standard old-fashioned doublet 15ft high. Some fun! -In an article entitled "Working DX", Byron Goodman (W1DX) noted: "the 28-Mc.band is the low power man's friend because excellent signals can be put through with little power when the band is open."

-W2QHH now has 62 **3.5-Mc.** countries, his 35-watter recently adding SP1CM, CT1BV, TA3GVU, OH2NB, FA8IH, VP5BD, EK1AO, VK5KO, CT3AB and SM4AEE. **7-Mc.** conditions haven't been too groovy down-under but VK5XK tells W3DLI that he is still passing out Kangaroo Island QSOs on 7033 with his 6L6. -W4PRL's 35-watter on 40 c.w. cornered many beside KP4AC and HH2JC.

FY8AA has certainly been raising a lot of rumpus with 14 watts on **20**-meters. -The famous 40-watter of W2QHH scared up SP1JF, 4X4DF, YO2BF, JA2DD, YS2LF, PK4DA and VP5BE of the Caymans on 20 c.w. -W7WEN runs five watts less than W2QHH's 35 but collected OA8A, VR2BU, CR7IZ, TF3ZM, FE8AB, VP8AK and VP5AS on 20 c.w. -W6GPB recently added VP1AA,

YU1CAG, HA5BF, PK3JT and the unstable 8-watter of AC4RN on 20 c.w. -KZ5ES's 6L6 at 20 watts on 20 c.w. tied onto a 200ft wire captured YV5AE, YV5DM, PJ1UF, PJ5FN, ZB1AR, KX6BA, EK1AR, FM7WF and FA9IO. -TA1AT is back on with about 20 watts and *W1BUE* was the only U.S station contacted among 45 countries worked. -KP4KB reached 187 countries with ET9X, KC6WC, KR6CA, FP8AC and MS4FM. Ev still awaits a QSL for his 9-watt KP4KB WAC on 20 c.w. -ZK1AB puts in a fat 3-watt signal on 20 c.w. from Raratonga as recorded by W4BGO. -VR2AP arranged to operate 14340-kc c.w. and phone with a 20-watt outfit while traveling on business through N. Borneo, Solomons, New Hebrides and Timor territory. -ZD3G received his Gambia callsign Jan 1 after a short stint as VS9AG/ZD3 and is having a ball on several bands. W8KX acknowledges his potent radiations on **10** c.w. where Lee feeds eleven ambitious watts to a 450-ft wire.

-SV7AA: "Highlights of my trip to the Greek island of Khios, some 50 miles west of Izmur, Turkey. My luck was to get a hotel room on the third floor and on the waterfront, with an eye for the best antenna location. Getting stuck on Crete by having my xmtr built for 220 a.c. input and finding the voltage 110 there, and having a lot of changes to make to the rig and running very low power on that account, this time I took a 220/110 xmfr. A 25 watt unit was all that I could locate. Here also on Khios, the line voltage is 110. The rig, a 6L6 xtal oscillator and 6L6 amplifier, ran about 25 watts input. I used a direct coupled 33ft length of #22 enameled wire thrown out the window during the night, only to find about half of it coiled up on the adjacent building's roof the following noon. Regardless of the poor antenna, my first CQ was answered by W7ETK, who sure surprised and pleased me. That morning wound up 28 QSOs in all but W0 districts. The second morning on, I worked 38 different stations besides Ws. I QSOed VE7ZM, CM2SW, and G5UX, who was my last contact on Tuesday, October 4. I am sure that there is no way of stopping 99% of the DX boys from being hogs. They just start a chain reaction calling a DX station, and the QRM just keeps increasing. My solution is never to work more than one station on the same frequency, but to look around after every QSO " (*CQ,* January).

-TA3AA's latest jaunt, that to the Greek isle of Khios, which is some 50 miles west of Turkish territory, has some interesting highlights. Jules thought he had let a nice 20-meter vertical down from the hotel window only to find the next morning that the wire was coiled directly below on an adjoining roof. Despite this, a 6L6-6L6 25-watt rig raised W7ETK on the first CQ. Beside his 63 W QSOs, VE7ZM, CM2SW and G5UX were able to crash the U.S. barrage, the last being SV7AA's QSO (*QST*, February). -TA3AA Jules also worked HC1HZ, VE2BV, KV4AA, ZL2FA. Jules said that while he was operating AR8AR he got a scare one morning when he almost lost his little 6L6 rig. It seems that he had his antenna hanging over the balcony of his hotel room and someone below gave it a yank.

Letter entitled "Kilowatts Anonymous":

"Editor: I suggest the formation of an organization to be known as 'Kilowatts Anonymous'. It will be devoted to the salvation of hams who are 'drunk with power' and to others more inexperienced who believe that a full gallon is the ultimate in amateur radio. As a former KW man, I know there must thousands like myself who have tried high power and discovered its many disadvantages. We would like to share the fruits of our experience with would-be kilowatters and so reveal the false glamour of 'going the limit'." [*Noted that tests with 54 stations showed that only one could detect a difference between 225 and 110* watts] (*QST*, June).

"An interesting letter from W2BXS gives us a slightly different slant on the good old subject of DX. For example, Jack, although reading the column for some years, claims he has been a DX man by proxy only. One reason for this was

that he was running 40 watts on 40 meters and as he put it, after reading about the juicy DX that other fellows worked, he felt "like a small boy standing outside the baseball park watching the players but unable to take an active part in his favorite sport". Things are a little different now since he has purchased a transmitter that will get him on 20 meters. He is still using the same old voltage-fed singlewire and thus far has startled some of the european countries when he tells them that he is only running 35 or 40 watts. *It appears that some of these overseas stations were of the opinion that QRP stations were non- existent over here*" (*CQ*, December).

QRP DXploits for 1951

(*R12 Sunspot Nr.: 72-47*)

The QRP Item-of-the-Month will have to allude to W1HE and his trusty 5-watter. This fellow has 85 countries and WAC with said soup. Either a doublet or a 3-element rotary is used. What's more, we understand that he uses this power all the time. To get the real kick from QRP work, you know, one doesn't have 'the big rig' standing by; in fact, one doesn't have a big rig at all. 'Twould be not unlike carrying along a slung shot-gun while hunting with bow and arrow.

-W2QHH got across the pond with less than 25 watts on **160** meters and the prize was GW3ZV. -W2QHH landed 9S4AX and is skedding ZB2I on **3567** kc. -17th ARRL DX Test: W7CWN was quite thrilled to work HP1BR from here on 3.5-Mc. with low power. *-The DL4FS log finds VP4TB who laid claim to running 1.8 watts on* **40** *c.w.s7! -On 40 c.w., the 30-watter at W1SVL raised OH3NY and VP7NQ. -TA3GVU made it WAC for W3OQJ's 45 watts, coming through on 7020.*

-At Fond du Lac, WIS, W9BQM has found it great sport to stick his 30 watts on Oceana for a total of 22 ZL and 3 VK QSOs. During a down-under '*ZL/VK QRP Contest*', ZL1HM, ZL3OA and ZL4GA were raised as they ran less than 5 watts input. ZL4GA also worked G6ZO on that power on **80** c.w. Back on A1 on 75 meters, W9BQM received a communication from ZL4GA reading, "*this is the first time a W has been contacted by ZLs during the annual ZL QRP 5-Watt Input Contest and not only can you claim a first, but the distinction of being the only one that has done so*".

-Kuwait VT1AC sticks to **14**-Mc. 'phone and c.w. with a signal emanating from a single 807 at 35 watts. -ETs 1, 2 and 6 AC were all operated at various spots during Sept. through Dec. of '50. A 6V6 crystal oscillator driving a 6L6 at 10 watts fed single-wire antennae and an SX-72 did the sniffing. A total of 105 contacts was accumulated. *-After getting hitched, I1PL changed QTH and brought along his VFO and receiver. Chas has 45 countries accounted for by this modest source using a random length of wire loaded through a pi-section coupler. XYL permitting, I1PL hopes to make it a really QRP DXCC.* -Things aren't really that bad. In fact they may be on the mend. KX6AA was the 100th country worked by W2JBL's 45 watts and vertical whip for instance; others: 3V8AN, TF3SF, LX1AS, CR7BB, VQ2JN, VQ4IMS, VQ4KRL, MF2ABE in Trieste, CR5AC, ZS3Q and ZE3JJ on 20 c.w. -KP4KD and KP4HU increased power on 20 to 35 watts on their joint enterprise KP4KB and reached 88 countries with folks such as ZC4AA, ET9X, PK6VK and FQ8AC.

-W2EQS hooked the 4-watter of VP9AI on **20** c.w. -The 6-watter of FO8AH was snapped up by W9HUZ. -W8OPG's list featured ZC4ZX raised with a 6L6 final on 20 c.w. -W2QHH's QRP on 20 has worked all the FP8s that have been active and Howie's newest include YU1AG, SP1JF, PX1AR, ZD1SS, JA2DS, HE1BQ, GC3HFE, 3A2AD with HB9NA in charge, and OE13FN. -XE1-- raised VS1BX on 20 c.w. with the latter using a 9-watt 2E30. *-To prove that the low-power bug isn't extinct in Kilofornia, W6HQN loaded up his 15-watter to work VS6, VK9, JA2 and DL6 on 20 c.w.* -40-watt work at W2QHH has now accounted

for WPR-200 and DXCC 200-country endorsements as well as 19 of the 22 Swiss cantons for the Helvetia-22 certificate. *-ZC4XP is now very close to a DXCC on both 'phone and c.w. and is about to do something unusual for these days. Sid is going to rebuild down from 150 watts to a permanent 20 watts. Could he have been chatting with W2QHH or VO3X?* -W9CFT heard from FG7XA and Andre's 10-watter has really been stirring up the QSLs. *-Andre Latile of the contemporary FG7XA had W4LVV on hand as a guest operator and Chuck really went to town. In twelve hours he rolled up some 250 QSOs using 14-Mc. c.w. for the most part. The 10-watt 6L6 crystal oscillator raised some 20 countries and also collected QSOs on 40 and 80.* -ARRL DX Contest Results, HB9CI comments: My best compliments to all U.S. amateurs for their FB receivers and antennas that pulled through my 20 watts input.

-In 1951, s.s.b. was still a developing 'special interest' area of ham radio and *QST* devoted a separate column to it. It was a new world of quacking signals that were unintelligible to the ordinary 'phone operator who was accustomed to a.m. -- unless he knew how to switch on his receiver b.f.o. and tune in the ducks. Use of the new mode was spreading, and WAS on s.s.b. was a hoped-for possibility suggested by the fact that W2SHN had worked 100 different s.s.b. stations in 29 states by the end of 1950. While most new s.s.b. stations were running up to a kilowatt, some experimenters with the new voice transmission technique operated at QRP levels without a linear amplifier, and periodic mention of their results appeared in the 'On the Air with Single Sideband' column. One such entry surveys the results obtained by W2ALJ who *"seems to be doing right well in breaking in the DX on the tuning technique. Among the DX worked on 20m were YN4CB, HH5SS, ZD6HJ and HI8WF."* Two QRP QSO's in particular were noteworthy: *"ZL2HP was worked while W2ALJ was running 10 watts peak output and, to top that one, CN8EJ gave a report of 'R5 with slight QRM' when the peak output was 7 volts across 52 ohms, or 1 watt!."* The columnist's comment: "That should stand as mighty good low-power 'phone DX, until some real [*???!*] DX comes along!" -A check through the log at W2JN showed that the peak input power at the time he was logged in England was all of one watt. That was on 75 meter s.s.b.!

QRP DXploits for 1955-56-58

(*R12 Sunspot Nr.: 14-164*)

An increase in submitted material after 1952 or so forced a change in the survey of DXploits in both *QST* and *CQ*: QSO's by individual stations were no longer listed, and were replaced by a grouped listing by band. As a result, the results attained by QRP stations fell by the way for the most part. Nonetheless, a few items slipped in. In the meantime, amateurs had been allocated the 15 meter band.

-W5QKJ surprised himself with YV5BJ on 30 watts on **80** c.w. -LU6DEM's 40-meter DX operation surmounts the obstacle of 220-volt d.c. mains supply. Joe runs 10 watts with his homebrew rig. -K2PGP got PY7AFK on 10 watts on **40** c.w. -W2CUQ/3's 4.9 watts on 40 c.w. made the grade with many Europeans, KH6AYG, IT1TAI, VP5BM and ZP6CR. -VP8BC works ZSs and Ws without much difficulty with his Falklands 7-Mc. 3-watter.

-VS9AS does quite well on **20** c.w. with 15 watts to a 6L6. -Ex-ZK2AA wants all old ham friends to know that he is back on the air with the call ZK1BS. At present he is using QRP. -Asmara's ET2RP, who signs W9MDV back home, stirs things up on 20 with twenty watts and a 700ft long-wire. -Egyptian licensing in four classes with 10, 25, 50 and 100 watts. Ten-watt licenses are for c.w. only. SU1IC labors toward WAS and DXCC with a 75/58 DX record at last tally -- not bad for an 807 at ten watts. -twenty-eight watts got HA7OL, KA3OO, OX3AY, TF6WAK, VP2VB/p, VQ4RF and YO3GY for W9UKG on 20 c.w. -W9SQP got

KG1JB, KV4 and Europe with but six watts input. -VR6AC struggles to get out with QRP on 14320 while awaiting higher power.

HB1CZ/ur. *"These quarters in cozy Sphinx Observatory at the 11,723ft level of Junfraujoch in Switzerland's steep Valais canton regularly shelters HB1CZ/vs for Helvetia-22 Contest work. Early last November Hans again fired up his 7-watt portable station as HB1CZ/ur in rare Uri canton to provide 311 QSOs for W/K/VEs on 14, 21 and 28Mc. HBs thrive in their heights like a species of electronic edelweiss." (QST, February, 1958)*

-35 watts is still the bait at VE7AIH on **15** phone, good for FB8BZ, Kuwait MP4, OD5, CR5, SP5CC, SV1AD, VPs 2DL, 5DC/Turks, VQs 4FO, 5GC,, VS2DB, ZB1EB, ZP5CF, ZS9, ZSs 3G and 3C. Gus intends to move up to 28 Mc. where a 1-element curtain array is readying for action. -An indoor ground-plane and 20 watts make Europeans come back to K2ITZ. -A fictional QRP'r takes part in post-Contest roundtable in "How's DX?": "*Skeds Stamplicker, a guy who earned his DXCC the hard way with 12.3 watts input and a scratchy receiver volume control*". Newkirk's sense of humor ... (at least not in poor taste -- like the case of the stupid QRP'r who walks up a hill to hear words of simplistic 'wisdom' from a certain resident DX columnist these days.)

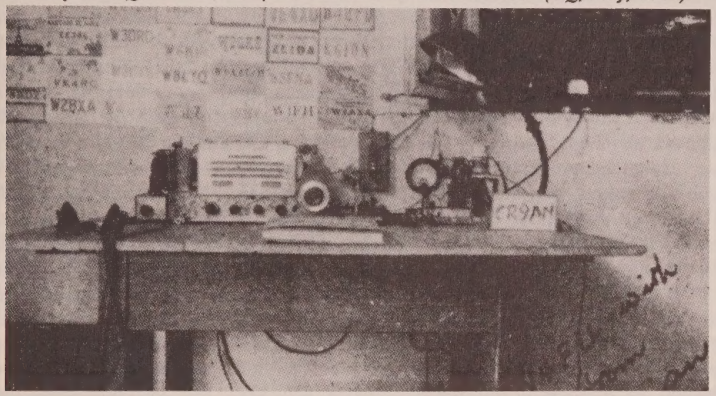
*"**VS1FJ's** homespun 25-watter claims a QRO-type DX record: 210/175. Antennas include a ground plane for 14 Mc.and an 86ft wire center fed with open line for 40, 15 and 10 meters. You may recall Frank's equally potent QRP DX work under previous VS9GT and MP4BAB colors." (QST, Dec. 1958)*

-10 c.w. was paid more attention in a few week ends than it has received in all of three years. G3IDG logged LZ1KPR, OQ5RU, UB5s KAA, KBR, KDR, UJ8KAA, VP8AI, YO3VI, ZC4RX and ZSs. HZ1HZ and W1LVH gave Allan's 10-watter two new continents on the band. -W3HYX surprised himself with HP3FL on 22 watts. -CR10AA, Portuguese Timor: "My transmitter is running about ten or fifteen watts input using a VFO followed by a VT-501-C British tetrode. The antenna is a half-wave off-center fed through a pi-section network ... If you could help me with some hints about QRP equipment I would remain very thankful."

-VQ8AS of Rodriguez Is. is interested in 7-Mc work and has had me (W2HMJ) listen for him on 7025 kc. His 15 watts occasionally show up around 14012 or 14051 kc for an hour or so. -JA4LL/MM's 40-meter c.w. 15-watter

worked a dozen countries and 100 Yanks in 31 states during a recent voyage from SF to NY via the Canal.

CR9AN. *"The 21-watt station of Adrian Rosario, CR9AN, in Macau. Transmitter is a 6L6 with 14-Mc xtal and the receiver is an all-wave b.c. job with b.f.o. added and ganged midget condensers added for bandspread. The antenna is a single section 8JK firing 25' east of north" (QST, February, 1947). "CR9AN. The small rig is a 6L6 crystal oscillator, running 20 watts, over 500 QSO's in 39 states. He says he is a confirmed QRP Ham, and prefers his 20 watts to the 250" (CQ, May, 1947).*



Postscript. *VR2BC (ex-VP1GG) submitted "Data on Equipment Used by United States Amateur Stations Which Communicated With VP1GG By 14- and 21-Mc. Radiotelephone From January, 1954, To July, 1955" to 'How's DX?' and Newkirk published it in July, 1956 with the note: "Occasionally out of the 'How's' mailbag flutters correspondence stamped as time-capsule material for the enlightenment of some future radio age." He termed the statistics "representative" and cautioned against uncircumspect interpretation. The data indicated the percentage of U.S. DX'rs vs power range on two bands:*

Transmitter Power Input

Watts	14-Mc	21-Mc
0-25	0.0	1.3
26-50	4.6	13.0
51-100	9.6	24.7
101-250	36.7	49.9
251-500	27.7	6.0
501-750	7.2	1.9
751-1000	14.2	3.2
Nr. Reports	1398	1462

Since it's introduction to amateur radio in 1923 or so, the vacuum tube had transformed through many shapes and sizes. While it was experiencing its most phenomenal successes ever during Sunspot Cycle 19, its fateful doom was being sealed by the nefarious little transistor. At the time, no one could have foreseen that innocuous appearing items such as "Transistor Transmitter DX" were, in effect, the preamble of the last will and testament of the vacuum tube. With that death came a rebirth of the pioneering spirit of QRP, and the world of amateur radio re-witnessed the cycle of the 1920's: an evolving technology coupled with low power conquests of new territories.

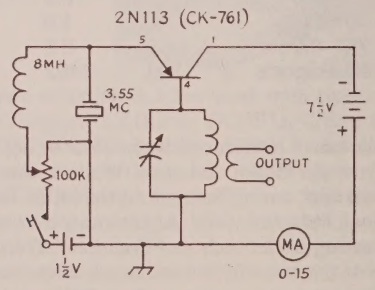
Chapter 11
Milliwatts and Miles

"...It doesn't appear that there will be much use made of Transistors in amateur work, unless it is in portable and/or compact audio amplifiers..."

In 1948, Bell Labs invented the transistor, the device which was to have such a profound impact upon amateur radio in general and the QRP movement in particular. *QST*'s Assistant Technical Editor Byron Goodman (W1DX) could not have sensed this when he penned the first introduction of the transistor to radio amateurs in "The 'Transistor' -- an Amplifying Crystal" in the October, 1948, issue. Even though the early devices were primitive, the Bell Labs invention was capable of a gain of about 20dB up through 5 MHz, with an upper limit of 10 MHz. Audio outputs of 25 milliwatts had been obtained in a push-pull circuit. Seven years passed before an enterprising amateur made known the results of his efforts to apply the transistor to amateur radio communication.

In his note "Transistor Transmitter DX" in *QST*'s 'Technical Topics' for October, 1955, Robert L. Ritz (W7UUZ) pioneered this virgin territory with a description of his circuit and the contacts that had been made. The single stage crystal oscillator used a Motorola XN-2 PNP device on 3.5 MHz which was designed to operate at i.f. frequencies of 455 kHz, but W7UUZ noted that *"experiments have shown that it operates very satisfactorily at frequencies in the 80 meter band"*. Maximum ratings for the device were listed as: *Vce*: 10v, *Ice*: 2ma, and collector dissipation: 20 milliwatts. He reported that collector currents of up to 4ma. in c.w. service were tolerated by the XN-2. The description of tuning procedures emphasized caution in regard to self-oscillation and thermal runaway as indicated by a rise in collector current above 2ma. W7UUZ's listing of his results were offered *"for whatever value it may have"*. The initial QSO's were made on August 22, 23 and 24, 1955, with 1.8 milliwatts input: W7DIS at 2 miles with a 339 report, a 369 from WN7AAV at 45 miles, and a 449 from W7TNF at 85 miles. The WN7AAV was an unarranged QSO. Later *"on August 25, contact was made with W7WPR, using the transistor running 2.5 milliwatts input"* over a distance of 200 miles with a 459 report. *80,000 miles per watt* is not bad for starters!

W7UUZ's **Transmitter Circuit - 80,000 M.P.W!**



W7UUZ seems to deserve credit for the first recorded skip contact using a transistor transmitter -- others may have preceded him though [*readers are invited*

to submit records to the author]. In any event, the ultralow power actually obtainable with transistors established the challenge of using the new technology.

W7UUZ's note motivated at least one *QST* reader to follow suit. In the December, 1955, issue of *QST*, Charles Atwater (W2JN) wrote in "Transistor DX and Two-Way QSOs": "*I threw together the few parts that make up the transistor circuit shown by W7UUZ and gave it a try on 80 on Monday morning, October 10,* 1955." The information given about his first QSO is the kind that sends the historian into an adrenelin surge: "*my first transistor contact was with W1QGU, Keith Henny at Snowville, NH, a distance of 266 miles.*" If this actually was the Keith Henney of the *Radio Broadcast* of the 1920's described in earlier chapters, then this QSO would constitute one of those "believe it or not" ironies of history -- to have the second recorded transistor skip QSO take place with one of the early QRP pioneers of the use of the vacuum tube would be an incredible coincidence! W2JN managed to sock a high power of 30 milliwatts to his Raytheon 2N113 (CK-761) for this QSO. In another coincidence, a second famous operator was listening in: "*Interestingly enough, this transistor crystal controlled signal was copied farther north by W1BB at Harrington, ME, 430 miles distant*". Again, echoes of the early days when listeners would telegraph reception of a QRP test! A week later, W2JN participated in what must be *the first solid-state two-way QRP QSO*: "*On Oct. 16th I had contact with W2PEO while running the high power of 30 milliwatts input to my transistor, and he was putting 20 milliwatts to his which, by the way, is a unit similar to mine. He reported my signals 559; however, I was hearing him about half the time due to QRM and being rockbound. By repeating, I was able to get everything. W2PEO has had a QSO with W8MIS in Grafton, WVA, some 350 miles away.*" And so, the story began again -- QRP pioneers measuring accomplishments with a new technology in hundreds and then thousands of miles, exhibiting heroic patience and perseverence through hours and hours of futile calling!

The reaction at ARRL Headquarters to these pioneering efforts was swift. *QST* Technical Assistant E. Laird Campbell (W1CUT) had a transitor rig up and running in time for a report on his results in the January, 1956, issue. Operating from Hartford, CT, W1CUT had worked four states with an input of 55 milliwatts (9v at 6 ma) with no prearranged contacts. The 'Stray' noted a direct connection to the QRP pioneering of the early days in commenting about a particular QSO: "*The best DX so far is W9ZA in Des Plaines, ILL, a distance of about 800 miles -- Coincidences. Back in the 1920s famous W9ZA worked a little low power DX himself: VK and ZL with a 199 (tube) and a 45-volt battery.*" Uncanny -- maybe it was the same Keith Henney! Somehow, the coincidence noted by W1CUT seems to smack just a bit too much of 'poetic justice': such ties to the past in the rebirth of a movement only happen in novels!

The cover of *QST* for March, 1956, featured the miniature transistor transmitter designed by W1CUT, and the "Our Cover" blurb opened comically with "*Look, Maw, no watts!*", an allusion to the fact that the W1CUT rig ran about 50 milliwatts. It went on and emphasized the pioneering aspect of transistor QRP: "*To those of you who are looking for new fields to conquer, the transistor offers an interesting challenge*", and closed with a sort of challenge to readers: "*say, who's going to be the first to make WAC with an all-transistor transmitter?*" W1CUT laid the cards on the table in opening his description: "*if you are one of those for whom satisfaction in amateur radio is measured by the number of 100 per cent QSOs per call or a high score in a contest, this article is not for you.*" The economics of transistors was also cited as a hindrance: "*it is very likely [the rig] achieves a new high in dollars per watt.*" It will appeal "*only to the experimenter -- the man who likes to try new devices and new circuits just for the kick to be got out of exploring new fields*"; and as yet, "*the ranks of transistor transmitters are still*

sparse enough so that anyone who joins up can have the feeling of being a pioneer." Perhaps without deliberate intention, W1CUT voiced a fundamental part of the QRP philosophy in these opening remarks.

The transmitter used a pair of CK761 transistors as crystal oscillator and amplifier. The construction of the unit is essentially identical to that found in transistor transmitters until circuit boards took over the task in the 1970's: a handcrafted chassis box from aluminum sheeting bent to order with components mounted on brackets and tie-points. Air-wound inductances filled the bill in the days before toroids. After surveying the fundamentals of transistors, W1CUT went on to comment on the "*nonuniformity among transistors of the same type* number" as a distinct disadvantage to the homebrewer with limited finances: "*in oscillators or high- frequency amplifiers it is unfortunately true that one transistor will work better or give more amplification than another of the same type.*" Hence, there was no guarantee that a duplicate rig would work like the original. His optimism that "*no doubt this situation will change as manufacturing techniques* improve" took much longer to be realised than he expected, as QRP homebrewers of the 1970's can attest! As in the 1920's, efficiency was a key concern: "*when operating at ultralow power every bit of r.f. counts, so every effort should be made to get the proper coupling to the antenna.*"

In his comments about operating with flea-power rigs, Campbell rejected reliance upon prearranged contacts, noting that "*except for answering a calling station, the only sporting way to make a low-power contact seems to be by calling a general CQ -- pre-calling with high-power just doesn't give the thrill that the low-power enthusiast is looking for*", another instance of his expression of the QRP spirit. His struggle to devise a successful operating strategy comes through clearly: "*calls such as 'CQ QRP' were tried unsuccessfully, probably because operators thought that the call was for another low-power station.*" He suggested that a "*gimmick call such as 'CQ TR' be adopted by all stations using low power (less than one watt)*". QRO operators could get in the fun that way, since they would recognise the caller as a real QRP'r probably using a transistor rig; QRP'rs would benefit since "*the low-power man appreciates receiving an answering call from anyone hearing his 'CQ TR'.*" W1CUT is to be credited for attempting to provide a realistic view of what to expect based upon his experience that "*using low-power transmitters has shown that it is more difficult than it really should be to raise other* stations." In the true spirit of QRP'ing, he attempted to analyze and understand his experience: "*Many a potential contact on hearing your weak signal assumes that conditions are affecting it; consequently, he passes up the idea of giving you a call because he figures his signal will be equally as weak at your station*". Hence the suggestion of a "gimmick call". His testimonial about the rewards of flea-power experiments: "*trying new devices and new circuits combined with a sense of accomplishment in establishing contact with stations at a distance on fractional-watt power*". By the time the article went to press, W1CUT had pushed his total to 7 states with up to 50 milliwatts input to an 85ft antenna centerfed with tuned line and antenna coupler. *QST*'s swift response to the possibilities of the new technology first suggested by individual 'QRP nuts', and its challenge to others to follow suit is reminiscent of its role in encouraging the movement to vacuum tube c.w. and the shortwaves in the early 1920's.

Major Gilbert's (K6LMW) "Ten-Meter Transistorized Phone Transmitter" was the next QRP unit to be featured in *QST* (December, 1958) and was introduced by the heading "New Terrestial DX Records on Solar Power", a new post-Sputnik distinction. The homebrew transmitter and modulator units were combined with a Regency receiver and converter to form a complete solar powered station. The array of solar cells from Hoffman Electronic Corp. must have cost a mint! Luckily Gilbert was a Hoffman engineer. Even though K6LMW extolled

the portability of the rig, it was rather large by current standards, with modulator and transmitter assembled in separate LMB 2.5 x 3 inch boxes totalling 14 inches in length. RCA 2N384 devices were used in a Butler crystal oscillator on 14 MHz followed by a buffer-doubler which drove a pair of 2N384s amplifiers in push-pull. Considerable progress had been made in transistor technology even in the two short years since the W1CUT rig had appeared. The 2N384s could handle up to 10ma. in the collector circuit. 28 MHz r.f. power output varied between 30 and 75 milliwatts, depending upon collector voltage (12-28 volts). Gilbert noted that the transmitter could be operated on the lower bands with an expected increase in r.f. output. His results: "*Two 2000 mile contacts, to Illinois, were made with the transmitter on September 13, 1958, on the 10-meter phone band, with signal reports of 57 and 59. On Sunday, September 21, stations in Texas, Missouri, and Minnesota were contacted with reports of 59, 55, and 59, respectively. These contacts were not pre-arranged and others have been made since.*" K6KMW showed that ultralow power transistor contacts were not merely "freaks" as the operators of the 1920's put it. And so, in the decade following the announcement of the transistor in *QST*, amateurs had once again moved ever downward in wavelength until 10 meters had been conquered, again by the pioneering QRP'r!

Articles about transistor transmitters and their results had began appearing in other places such as *Radio Electronics* and *Popular Electronics* as well as in *QST*. By 1958, transistor QRP'ing had found its first regular forum in Donald L. Stoner's (W6TNS) 'Semiconductors' column in *CQ*. For a brief three years until Stoner left off covering the transistor transmitter scene, QRP had a regular spot in the limelight, the first since the pioneering days of the 1920's. Stoner himself was apparently quite a transistor QRP enthusiast, judging from his tone. Major advances in transistor technology were reported in a humdrum fashion. But when he got onto the subject of making contacts, the adrenalin flowed and his imagination flared. His first writing (*CQ*, February, 1958) on the subject is worth quoting in full for this reason:

> *Every so often I get struck right betwixt the eyes with a 'real ball of fire idea'. Everybody likes a contest and with the current interest in the mighty milliwatt transistor transmitters, why not have a 'battle of watts' to see who do the best with the least. After batting around several pads of scratch paper I believe that I have devised a formula that will be fair and equitable to everyone from 160 meters on up. I looked through all the publications that I had available and found several accomplishments with transistor transmitters. The figures were substituted in the formula and the results were rather close. It works like this. The power in milliwatts is divided into the frequency in megacycles and the resultant is multiplied by the distance. CW, phone, sideband, all's fair, even 60 element beams. The idea is to radiate as much as possible with the lowest power input.*

His illustration of the formula reveals some of the transistor DX work that he knew about: "*let us examine an actual case history. E.M. Washburn, W2RG built a transistor rig using a pair of 2N104's. According to his article in 1HAM TIPS (July, 1957), he succeeded in working ZS6TR in Tansvaal South Africa. This was a distance of 8000 miles while running 216 milliwatts on 7002 kHz. Substituting W2RG's accomplishment in the formula results in 256 points.*" Two others were mentioned: "*Richard Griffin, W7MPQ, is the leader with 5500 points. As you may remember from his article in* Radio Electronics *(May, 1957), Dick managed to work Canton Island (KB6BC) on 29 mc. This was a distance of 4500 miles while running only 24 milliwatts! Also listed this month is Monty Hart, VE3TA, who has fired up on 80 and 40 meters. He managed to snag K2UYW for a distance of 400 miles while running 36 milliwatts on 3570 kc.*" Stoner's idea was to list the top five leaders in subsequent issues. The plan never worked out, probably because of the

complexity involved in the formula, which obscured the basic data sought by QRP'rs such as distance, power, number of states and the like. Rather than viewing QRP accomplishments in the context of the traditional 'miles per watt' standard, Stoner's scoring formula translated them into an obscure context. Unfortunately, Stoner failed to provide the necessary data for most of the QSO's recorded in his coverage of transistor work. Similarly, his emphasis upon a 'battle of watts' created a competitive context which probably worked against increased participation by many readers, given the records that had already been noted.

Stoner presented two transistor circuits along with the contest idea. VE3TA's transmitter used 2N247s in crystal oscillator and amplifier stages. While VE3TA used it on 80 and 40 meters, W6THS noted that by using suitable crystals and coils it should work on 10 meters. He further explained that "*since the semiconductors are operating Class C, and since they are used for CW work, I believe that as much as 150 mw. could be run safely with units such as the 2N247.*" Good thermal connection to the chassis would permit 'fudging' the dissipation rating of 50 mw by this phenomenal factor of 3X (so he said!). The second circuit was Stoner's own design for a 10 meter 'handi-talkie' consisting of a Philco SB-100 doubling as a super regenerative detector and crystal oscillator modulated by a 2N44. Although he hadn't attempted any real skip work with a decent antenna, "*The best DX to date is about 900ft using a 20 inch whip.*" At the time, the 'handi-talkie' application of transistor transmitters was a primary interest of experimenters who measured their results in distances of feet and a few miles.

Stoner returned to transistor QRP DX in the December, 1958, issue with an account of his recent successes with the 'Semiconductor Space Spanner' which he'd designed. After noting that "*it wouldn't be too improper to do a little horn* tooting" on his own, he provided the details: "*On Sept. 20, at 1410 GMT, I contacted 'Empty' Wessels, ZS6KD, on 20 c.w. The contact was over the long path and as close as can be figured, the distance is approximately 16,606 miles to Johannesburg.*" Power input at the time was 90 milliwatts to a Gonset 3-element tribander. The feat was duplicated the following weekend when ZS6KD made a tape recording of W6TNS's RST 548 signals. This led Stoner to attempt WAC with the rig. He wrote: "*On Sept. 22, I snagged KL7BDK, in Kodiak, for the North American contact. Signals were 559. The next evening, CE1AGI, near Santiago gave me an RST 449. Asia was 'duck soup' from here, and a call to KA2YA, near Tokyo, produced the best RST of all, 589 on Sept. 24. Later that evening, at 0800 GMT, my good friend Mick, ZL3PJ, listened for the germanium giant, and gave me an RST of 549 from Oceana. Then, I tackled Europe. Many tests with Dave, G2MA, produced negative results, until the 4th of October. Dave's report was 529.*" The impressiveness of Stoner's achievement is undercut by the fact that *all stations were first contacted on s.s.b. before he QSY'd to 90 milliwatt c.w.* Otherwise, no WAC would have resulted, since "*they spent quite a bit of time dredging around in the QRM for* me". Stoner recognised this when he later remarked that "*these QRP experiments were of no practical value, other than to show that it could be done.*" Evenso, the very fact that his 90 milliwatt rig had been heard on all continents counts for something. He closed the QRP section of the column with an announcement of K6LMW's record contacts on 10-meter solar power as noted above.

Stoner's column for the May, 1959, issue of *CQ* mentioned several items of interest to the transistor QRP gang. He showed two circuits upfront that were being used in the Vanguard and Explorer I satellites. Both developed 10 milliwatts output on 108 MHz; the former unit used a Western Electric WE-53233 crystal oscillator, while the latter used a pair of Western Electric WE-53194's. The circuits were offered as an inducement to the 2-meter gang for possible adaptation to that band. The progress in semiconductor development is revealed in the bandwidth product (*fT*) of these devices and the Texas Instruments 2N1141

with 12dB gain at 100 MHz at a rated dissipation of the monumental power of 750 milliwatts with a theoretically infinite heat sink.

However, the exciting QRP development announced in the column was *the initiation of 'QRP CORNER' to be conducted by Richard S. Griffin, W7MPQ*!! Stoner explained: "*With so much interest in kilowatt transmitters these days, it is refreshing to sit back and watch the QRP rigs come on the air. However, it would seem to be a good idea to have a rallying point where QRP fans can coodinate their efforts. To this end, the 'QRP CORNER' will be a regular feature of this column.*" In effect, this was the first regular coverage of QRP in U.S. amateur radio in history except for the 'Low Power Contests' featured by *QST* in 1924-25, which were not meant as a 'column' type coverage. The selection of W7MPQ as contributing columnist was based upon his achievements as a QRP'r: "*By way of introduction I should tell you that Dick was the boy who got the QRP ball rolling by working Canton Island (KB6) from his home in Tucson, AZ. His efforts gave me the bug to build The Mighty Milliwatt and Semiconductor Space Spanner. So, if you are running less than one watt to a transistor rig, drop him a line and tell him of your successes.*" Stoner closed the announcement with a suggestion that QRP calling frequencies be established to facilitate coordination of QRP experiments. The emphasis was entirely upon transistor transmitters and excluded tube-type QRP'rs; furthermore, no one was running any power even remotely approaching one watt with a transistor!

W7MPQ began his first 'QRP CORNER' with a brief note about the mystery of transistor communication: "*It appears that it isn't always power that makes the QSO. It may seem strange, but that tiny drop of radiation sent on its way by the transistors somehow can be very readable many thousands of miles away*". That basic fascination with this unplausible phenomena is well known now to thousands of QRP'rs around the world! W7MPQ went on to deal with a problem that has all but disappeared for modern QRP'rs: "*One major problem for many hams operating transistorized transmitters is the lack of others willing to listen. I have found it sometimes take a fair knowledge and ability to tune a receiver if the low-power signal is to be read*". Griffin ought to be around to hear what happens on the QRP Calling Frequencies these days during a QRP NET session or one of the QRP contests! He suggested a monitoring frequency of 29.2 MHz as a place for transistor QRP'rs to "get results with their low power rigs" and invited other suggestions. The basic purpose of 'QRP CORNER' emerges in W7MPQ's closing invitation: "*The QRP section is for you who are on the air with semiconductors. Tell us what's new so that it can be passed on. With your help others will make better QSO's with their transistors and low power.*" W7MPQ's efforts looked forward to the second 'QRP CORNER' founded by Mike Czujahewski, WA8MCQ, in the *QRP/8* newsletter in 1968 which eventually metamorphosed into *The Milliwatt: National Journal of QRPp*, QRP's first international forum for the exchange of ideas and information. The major difference between the two versions of 'QRP CORNER' was that WA8MCQ's concept included all QRP'rs, transistor and tube alike.

The first fruits of W7MPQ's efforts appeared in the July, 1959, issue of *CQ*. He had received responses from two QRP'rs. Bob Brown (W3RZL) commented: "*Very glad to see that there will be a QRP CORNER.*" He reported that he was about to go on the air with a rig patterned after one by W6TNS and that it was likely that he would have had some good QSO's with his milliwatts by the time the column appeared in print. He expected to operate on 28080 kHz at first, and then 21070 kHz at a later date. Neal Brown (W7SLO) reported having had good success with a small transceiver on 10 meters which used RCA transistors in the transmitter and some by Philco in the receiver. But as yet, his QSO's with a short whip were limited to tests contacts with similar equipment several blocks away.

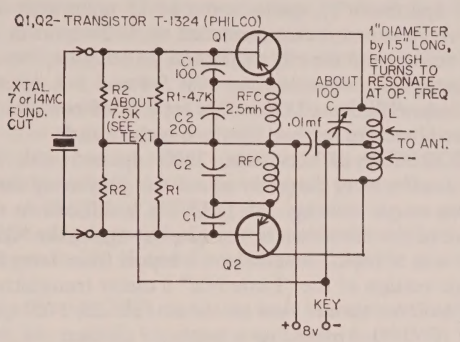
This modest beginning of 'QRP CORNER' grew into more substantial regular reports on QRP successes in later issues.

'QRP CORNER' in the August, 1959, issue was packed with QRP information. Mel Buechal (W9RPH) reported about his operations on 6 meters in the Chicago area. With his rig developing 80 milliwatts input to a pair of 2N384's modulated by 2N408's and a 2N652 and loading a mobile whip, he was received at a distance of one mile by another mobile. With the little rig hooked to his 5-element beam, he managed his best DX of 35 miles with a 55 report on 6 meters. The transistor receiver section was a crystal controlled, fixed frequency single conversion superhet. For 6 meters, that was a decent 'record'. The promise of W3RZL's earlier report blossomed into a report of success with the W6TNS circuit: "*He has worked a number of locals on 10 meters, and on 20 meters his best contact was to W9QGR with an RST 539. Bob has had the SSS rig on 15 meters and his report from K4PHY in Tenn. was 449.*" W7MPQ paused at this point to allow W3RZL to tell about the 'big one' in his own words: "*Now hold your hat -- on 21036 I worked LU8FBH with a report of 599, hi, and I am eagerly awaiting his QSL. At present I am maintaining skeds daily at about 1700 EST with LU8FBH so he will probably direct some South American traffic this way as he is passing the word along down there.*" Presumably this 'traffic' consisted of information about QRP operations by S. American stations directed at the U.S. W3RZL operated on 14061, 21036, 21076 and 28080 kHz, and showed up on 15 meters after 1500 EST. Then W3WJD in Upper Darby, PA, was reported as running 275 milliwatts to a 2N599 on 3.5- and 7 MHz, but had not yet sent in results. And finally, W6TNS "*would like to brag about his newly acquired CW- WAC certificate for working all continents while running 80 milliwatts to the SSS transmitter.*" In addition to the reports, this 'QRP CORNER' featured a circuit by Jerry Palmer (W6CQJ) using a pair of Philco T-1324's in a push-pull crystal oscillator on 40 and 20 meters. The unit ran 60 milliwatts input and the circuit note is interesting: "*The constructor should play around with R1 and R2 until each transistor draws about 8 ma. W6CQJ says that the transistors are not too uniform and he wound up with a 10K-Ohm and 4.7K-Ohm*" in the R1-R2 base-bias circuit. W6CQJ noted: "*my best DX without pre-arrangement is 650 miles with a 569*" and commented that he had best results when he signed 'QRP W6CQJ'. The W6CQJ circuit appears to be worth duplicating even today, although most of the circuits provided in 'QRP CORNER' are outdated.

Stoner followed up the W9RPH report by featuring his 6 meter transceiver circuit in the Septmeber, 1959 issue. The usual need for experimentation with the transistors appeared here as in other descriptions of transitor rigs: "*you may have to select transistors for the oscillator position to be able to drive the final to at least 5 ma. when the final is tuned off resonance. By the same token, you may have to select final transistors to find one that will draw the most current with a given amount of drive.*" This method of 'pruning' a circuit by substituting transistors rather than varying component values is still widely used by QRP'rs. W7MPQ's 'QRP CORNER' opened with James V. Smith's (K9MHU) suggestion of 7145 kHz for the 40 meter calling frequency since it is "open more often than other spots in the 40 meter band". Jack Shaugnessy (K2TTC) of Hollis, NY, reported being on the air with about 36 milliwatts on 10 meter phone for the past year. In that time, he had worked some 60 locals and "*has three confirmations from out of town. The best report on Jack's 36 mw. was an S-8 from Boynton Beach, FL. Q5 all the way through the QRM on 28.72 MHz.*" It appears that the QRP bug bit as strongly in 1959 as in modern times: "*Jack notes that he has 120 watts on tap but has not had it turned on for a year!*" QRP's advantage in the TVI department was noted in as much as K2TTC's TVI-free rig had a problem with finding someone else on during prime time TV hours! Jim Bodnar (W8UQZ) of Cleveland, OH,

reported being in the construction phase with a rig for 20, 15 and 10 meter c.w. and phone which would be completely portable.

***W6CQJ*'s Push-Pull Transistor Transmitter Circuit.**



The November, 1959, issue featured two transistor rig circuits. Jerry Meyers' (W6LZY) 40 meter phone transmitter used a 2N371 crystal oscillator modulated by a pair of Class-B 2N190s and was mounted in a 3-inch square box. B+ could be varied from 9-13.5 volts. The unit could be used on c.w. by disabling the modulator section. The results obtained with the rig on phone include stations in the 3, 5, and 7 call areas! The second circuit was a 40 meter c.w./phone transmitter by A.G. Smith (VK3AN) scrounged from the Australian *Amateur Radio* magazine. A 2N371 crystal oscillator drove a 2N370 straight through amplifier stage with the feedline tapped down directly on the collector tank coil. The simple modulator consisted of a carbon microphone and transformer hooked directly into the B+ line. VK3AN's results: "*The little rig has been copied on c.w. at RST 549 by VK5JE and by VK7MX and MZ on Apple Island. The contacts were established with a 10-watt rig. Cliff, VK3AJA also copied the rig with an RST 449 on c.w. and later on phone.*" In 'QRP CORNER', Wm. J. Engle, Jr. (W3KKO) of Philadelphia reported "*amazing results on 10 meters with a transistor handie-talkie with 40 milliwatts input*". The best DX was Toledo, OH with the rig hooked to a 3-element beam. For local work, the rig used a 30-inch helically wound whip. This was followed up by a short report in the January, 1960, issue about the work of Major Gilbert (K6LMW), "QRP DX'er extraordinary!" who "*lists 14 states worked using 75 milliwatts on 10 meter phone. Stations worked are W9UCZ (IL), W6MV (CA), W0TBL (MO), K0CUO in (MO), K5DLY in (AR), K5HCM (TX), W5JW (LA), W0LFL (KS), W4OGG (TN), W8RNU (WI), W5JCS (OK), KL7ARC (AK), K4CLG (AL), and W5TXK (MS).*" The report was accompanied by a reproduction of K6LMW's QSL card featuring the photo of his solar power station from *QST* (December, 1958) feature article.

CQ for February, 1960, featured Capt. John J. Sury's (K8NIC/5) "Little Nic Transistorized 6 Meter Transmitter" for the Technician Class licensees whose frequency allocations included 6 meters and higher bands. The transmitter consisted of a 2N499 crystal oscillator driving a 2N384 amplifier which was modulated by a pair of 2N190's. In his discussion of the circuit, K8NIC/5 listed prices for some of the transistors that could be used: the 2N499 listed at $5.00 while the Philco 2N588 could be substituted at less than $3.00. Total cost of the rig was listed as "approximately $24.00" (a Heathkit DX-40 75-watt all-band c.w./phone transmitter kit sold for $64.95 at the time). 40 milliwatts of transistor r.f. didn't come cheaply back then! In opening the piece, Sury made the usual disclaimer: "*Many of our Technicians and General Class license holders feel that a lot of*

power is needed to make contacts above 50 Mc. within a 50 miles radius, especially when the band is not open. This is not necessarily so." He noted some results with two antennas. With a 1/2 wave indoor halo antenna ("in a wire meshed screen reinforced stucco apartment"!), contacts out to 15 miles with S-3 reports were made on phone. A 5-element beam produced an S- 2 report at a distance of 30 miles across hilly terrain and the city of Dayton. In addition, "*several 6 miles contacts were made using 15 milliwatts input with S-4 and S-5 signal reports using a matched gamma indoor antenna.*" Overall, a total of 46 contacts had been made. The distances noted here are not bad for the 6 meter band.

The 'QRP CORNER' of the June, 1960, opened with a complaint by W7MPQ: "*Most readers have forgotten about this section of the Semiconductor Column, or else no one is working with QRP.*" It is difficult to determine which was the true cause of the slowdown in reports, but again, the 'QRP = transistor' formula probably was at fault. Nonetheless, a report from Jerry Fortier (W7IDI) on success with his version of the "Little Nic" 6 meter transmitter was quoted in full and reads: "*I built her up and went on the air Feb. 23, 1960 running 12 volts at 8 ma on the final (2N384). I racked up a total of 9 contacts the first night, located about 7 miles from Seattle and 20 miles from Tacoma. My first contact was K7BAG, who gave me a Q4-S5 report. However, he is on the other side of a hill. I made several contacts in Seattle and then swung the beam (8 elements at 53ft) south -- K7ASY in Tacoma gave me a Q5-S9 report. K7GSE (2 miles away) gave a 5-9 plus 40dB report! K7ENS, Tacoma reports 5-9 plus 10dB. The big thrill followed. It seems K7GSE was in QSO with Walt, W7PVZ, in Tumwater, WA (about 45 miles away). I gave a break-break when Frank, K7GSE, was talking and to my surprise Walt heard me!. Signal reports were Q5-S5 with very good audio quality.*" W7MPQ ended with the standard point drawn from QRP accomplishments: "*Let's see more 'Little Nic's' on the six meter band, gentlemen. Jerry has shown what can be done with QRP equipment.*"

The July issue reported on the work by George Calhoun (KH6VF) who was "*having a ball with his mighty 100 milliwatt QRP 40 meter rig. On April 5, George was in contact with W8QOH/5 in New Orleans and W6RW in Los Angeles. Both stations stood by for the QRP job and W6RW reported RST 349, although the W8 couldn't hear him.*" W7MPQ pointed out that "*the contact is even more amazing when you consider that George was operating in kilowatt alley on 7007 kc*". Then on April 15, "*KH6VF worked W6ASH in San Francisco without firing up the big rig. His report was 439 and W6ASH made a tape recording of the transmissions.*" KH6VF's rig used an RCA 2N373 oscillator driving a 2N373 r.f. amplifier, transistors chosen because of their low cost and high performance. A 12.5-volt mercury battery supplied the 8ma. to the rig. Finally, W7MPQ noted that "KH6VF can contact Hilo (about 200 miles away) by QRP'ing the QRP rig and running 6 volts at 3ma. and receives 569 reports!" That "see how low you can go" urge has produced some phenomenal QRP results from the very beginning! But, alas, this was the last appearance of QRP CORNER and QRP'rs lost their forum.

Don Stoner continued his coverage of the QRP scene with a few notes and circuits in later issues. In October, 1960, issue, he described experiments with the Texas Instruments high power 2N1046 and presented the circuit of a linear amplifier for 80 and 40 meters. Driving the amplifier with about 30 milliwatts from a grid dip oscillator, he manged to obtain an r.f. output of 2.15 watts at 4 MHz and slightly less at 7.5 MHz. He believed that the device could be used on 20 meters with reduced output. The November, 1960, issue contained a note about ZL1AAX: "*Les Earnshaw, ZL1AAX, an 'ole time at the QRP game has done it again. You may remember that Les had a two way QSO from New Zealand to Kentucky on 20 meter sideband with a transistorized rig. The final, an RCA 2N247, ran 20 milliwatts and was coupled directly to the beam.*" The occasion for

mentioning this feat was that ZL1AAX had QSO'd ZL1AOF at a distance of 160 miles using a crystal controlled tunnel diode oscillator at less than 1 milliwatt input with "*the power (?) output in the microwatt region!*"

The QRP transistor transmitter came of age by the July, 1961 issue in which Stoner featured his one-watt c.w. transmitter design. In opening the column, he referred to his earlier exploit of working a five continent WAC with an 80 milliwatt transistor rig and noted: "*These contacts provided more enjoyment than working any rare DX with a full gallon*", but these "*QRP experiments were of no practical value, other than to show it could be done, since the contacts were made in liason with higher powered initial contacts.*" But advances in technology had changed the situation rapidly to the point where it was "*no longer necessary to contact a station and have him listen for your transistor rig, or call CQ-TR for hours on end.*" The three-stage transistor transmitter described in article was capable of one-watt r.f. output on 20, 15 and 10 meters and capable of raising its own contacts.

Unfortunately for the QRP cause, the lack of response complained about by W7MPQ in the June, 1960, issue persisted and resulted in 'QRP CORNER' being dropped as a regular feature from Stoner's 'Semiconductors' column. The feature went through eight appearances from May, 1959 to July, 1960, and publicised the efforts of the 'lunatic fringe' which accepted the challenge of applying the new technology and making contacts with extremely low powers. In assessing the failure of 'QRP CORNER', several possible reasons emerge. First, it may have been due to the fact that only a handful of amateurs were actually using transistor transmitters at the time. The challenge presented by the ultralow powers obtainable with then current devices was an extreme one, as modern QRP'rs can attest. Consistent success with relatively high powers on the order of 300- 500 milliwatts is difficult and requires considerable patience even today. Few modern QRP'rs are willing to endure the frustration that is inevitable when powers are dropped into the range below 50 milliwatts -- that is super-QRP in any period! It is likely that many fellows gave transistor QRP a quick try until they made a few contacts, and then realised that monumental odds were against them. Stoner's reference to "calling 'CQ-TR' for hours on end" gives a good picture of what they faced. Most of the modern QRP'rs whose transistor experience reaches back into the 1960's started out with devices capable of putting out a half-watt or more, and they will recall how difficult it seemed to make contacts at that power level! Economics was probably a decisive factor with respect to the number of transistor experimenters. Ultralow power transistors were available in the $2-5.00 range. Compare this with the cost of an exact frequency crystal at 79 cents or an 807 at $1.20! However, to get up into hundreds of milliwatts, the cost increased sharply. For example, when W4IMP converted his famous "IMP SSB Exciter" to solid state in 1961, he expressed amazement that new 'high power' transistors such as that used in the final amplifier had dropped dramatically in price, making the solid state route even more attractive. He was referring to the *2N706 and 500 milliwatts for $13.00*! Second, the slant of 'QRP CORNER' probably contributed to its demise. Its focus was exclusively on ultralow power transistor transmitters. Hence, while it did present some information about QRP contacts, the underlying emphasis was upon the record breaking type of contact. And third, while QRP CORNER presented interesting circuits, it offered very little in regard to advising prospective transistor QRP'rs about the methods of operating an ultralow power station. It probably would have survived and flourished had it been aimed at the broad range of QRP operators.

Evenso, Stoner's efforts to promote transistor experimentation produced some valuable records of the early transistor achievements. These QSO's are here converted into the 'miles per watt' standard for comparison with the 'records' found in previous chapters: [1]

Station	Miles	Watts	M.P.W.
W2RG	8000	0.216	37,037
W7MPQ	4500	0.024	187,500
VE3TA	400	0.036	11,100
W6CQJ	650	0.060	10,830
W3KKO	529	0.040	13,225
KH6VF	2200	0.100	22,000
KH6FV	200	0.018	11,100
K2TTC	?980	0.036	?27,200
ZL1AAX	160	0.001	160,000

In terms of the 'miles per watt' standard, these early transistor pioneers can clearly take their positions of honor beside the early vacuum tube pioneers!

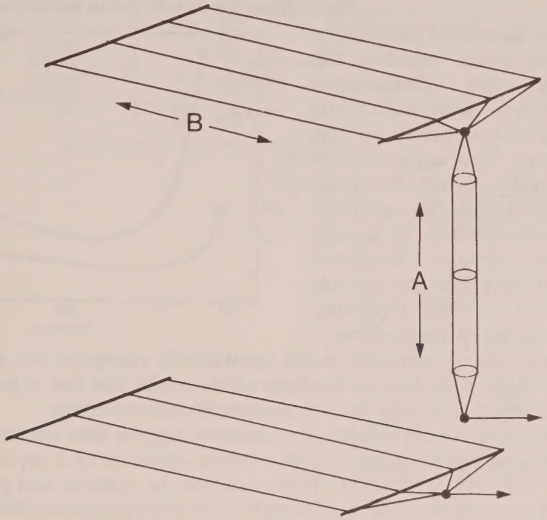
Epilogue

Whatever the causes of the demise of 'QRP CORNER', the QRP world would have to wait another six years before W7OE founded the Pacific Amateur Radio Guild and began publishing its excellent newsletter *PARG* for QRP'rs, and eight years before WA8MCQ would resurrect the concept of a 'QRP CORNER' in the *QRP/8* newsletter, and a decade until the coming of *The Milliwatt.* Until then, QRP'rs had to pursue their lonely experimentation without a regular place for the exchange of ideas and information. In sticking to the challenge of QRP across these years, they had to be satisfied with sporadic QRP construction articles such as those by Wes Hayward (W7ZOI) and *QST* Technical Editor Doug DeMaw (W1CER/W1FB), rare feature articles such as J. W. Dreher's (W2TKG) "The Challenge of Milliwatt Power" (*QST*, October, 1965), a rare tidbit in the 100-watt QRP ARCI's newsletter, and learning from their own successes and failures. Once *The Milliwatt* got underway in 1970, QRP'rs would have a home and QRP would begin a fabulous 17 years of unmitigated growth which would produce a world-wide network of QRP clubs such the G-QRP Club in England (1974, Rev. George Dobbs, G3RJV), The Michigan QRP Club (1978, Ralph Burch, W8LCU) and clubs in about a dozen other countries which were coordinated by The World QRP Federation (1978, Thom Davis, K8IF). Once the 100-watt QRP ARCI was transformed into a genuine 5-watt QRP organization in 1980 under the leadership of President Thom Davis, QRP began to prosper in the U.S. as never before. And we've seen just the beginning!

Appendix A
Flat-tops and Counterpoises

Radio technology developed rapidly in the first five years of the vacuum tube and left many mistaken ideas and practices on the scrap-heap of history, inscrutible to modern minds simply because they were discarded. Hence, some readers may be interested in a more detailed discussion of the problems faced by the early pioneers as surveyed in Chapter 2. Their antennas are the logical starting point.

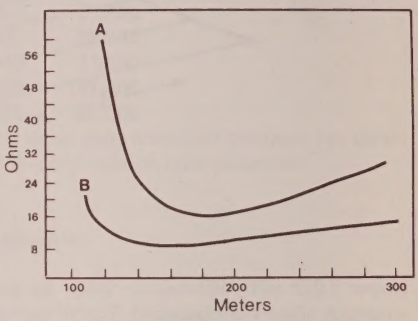
Fig. 1. The Flat-top 'L' Antenna with Large Area Counterpoise.



The antennas discussed in Chapter 2 (pages 34-37) may be difficult to visualize from the descriptions provided there. Figure 1 shows the details of the common 'L' configuration. The 'T' configuration differs only in that the vertical cage portion is connected at the center of the flat-top horizontal portion. It seems that, in general, the horizontal portion of the 'T' type employed cage construction, with the leg on each side of the vertical portion constructed in the same manner as the vertical section. As noted in the text, both types are roughly analogous to the modern concept of the top-loaded very short vertical antenna. The effective height (or length) of such a radiator is determined by the actual vertical portion (A) plus the top-loading horizontal section (B) for the 'L' type that is still used on 160 meters as the 'Inverted L'. Given either flat-top or cage construction for the 'T' type and the resultant distributed capacitance, the effective height of the 'T' type was only slightly less than the 'L' type, requiring a slightly larger length. With only a single thin wire instead of the 4 wires spaced at 9ft or 4 wires in a six-inch cage forming the horizontal portion, the effective height of the 'T' would be $A + B/2$, or the length of the 'L' formed by half of the horizontal portion of the 'T'. In these terms, Gunn's antenna (see pages 34-35) at 72ft (A = 35ft, B =37ft) was about 0.17 wavelength plus an unspecified lead-in length, but because of the cage construction, which achieved a lower effective capacitance than the flat-top approach, the actual effective radiation resistance was lower than would be expected for an antenna 60 degrees in length. Thus, the resistance to be expected for such a length would be about 13 Ohms, but Gunn's Curve B (see Fig. 2) shows a resistance of about 10 Ohms, quite close to theoreti-

cal expectations. The dimensions suggested by Kruse for 165 meters, on the other hand, work out quite closely to those calculated by formula (125ft vs 129ft) for a quarterwave vertical, but recall that these are suggested dimensions, not data for actual functioning antennas. Moreover, references to the measured resonant frequency of antennas described in early articles must be approached with caution because of the crude method employed at the time for measuring antenna system resonance (described by Kruse in 'A Simpler Way to Find the Fundamental', *QST*, January, 1925).

Fig. 2. Ross Gunn's Antenna Resistance Curves.

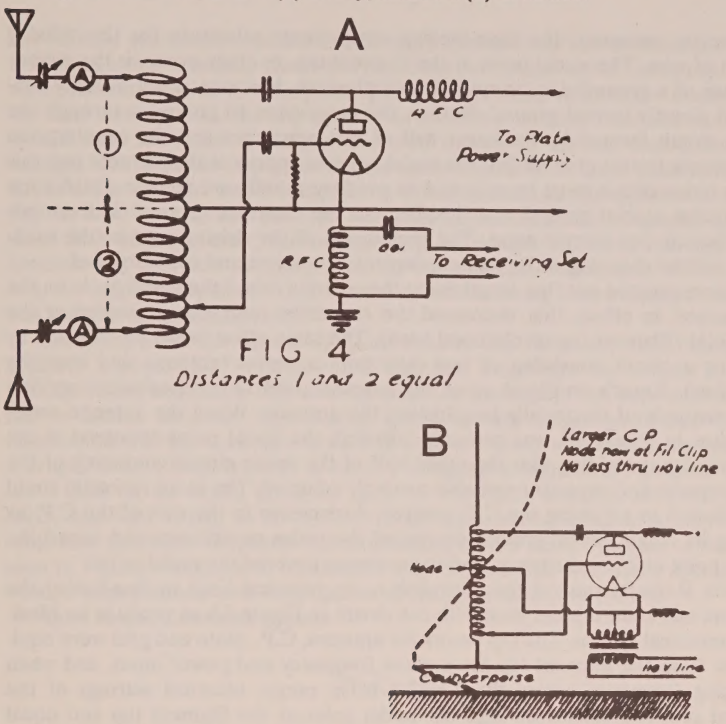


In fact, Kruse debunked the need to determine the exact resonant frequency, or the *fundamental wavelength* in their terms, and the use of a formula was described as 'not very satisfactory'. This was a common sense, empirically correct conclusion in the days of the Hartley oscillator. The antenna system was, by analogy with modern circuits, connected directly to the frequency determining portion of a v.f.o. circuit! Obviously, the process of analogy breaks down here since any modern amateur would immediately recognise the stupidity of attempting to make such a circuit perform satisfactorily! But that is just what the early pioneers did in chaulking up their remarkable achievements.

The transmitting system which they somehow juggled into successful operation was comprised of (1) a very short antenna operated as a top-loaded, ungrounded vertical with (2) a counterpoise between the antenna and ground, and both (3) were connected to the multi-purpose inductance shared by the plate and grid circuits as well. The complexity of the problem can be appreciated by reference to versions of the Hartley oscillator transmitting system. The version shown by J.O. Smith in 1921 (see page 38) represents the initial stage of the Hartley system evolution, with the antenna tapped directly onto the inductance and a variable capacitor completing the circuit to ground. The grounding capacitor in Smith's circuit was soon replaced by a counterpoise which performed the same function. John Reinartz's (*1XAM*) 1924 version, seen in Figure 3A, represents a perfected example of the second phase of development of the Hartley system. The grid-plate negative feedback loop is established by tight coupling between sections 1 and 2 of the inductance, with the filament tap establishing circuit ground, and the antenna and counterpoise are coupled through series capacitors to the same inductance. The tap points would be determined experimentally. An example of the final stage of Hartley evolution can be seen in the K7BWZ transmitter circuit (see page 134). That circuit is essentially the same as that presented in Nicholas Hagemann's 'A Universal Short Wave Transmitter' (see pages 73-74).

Adjustment of this complex system was a tedious process. Before the new insights by Gunn, Kruse, Reinartz and Mason began appearing in *QST*, tuning was a 'simple' matter: adjust the plate, filament and grid taps to give healthy oscillation on the desired signal frequency , and then find the antenna and C.P. tap points which produced the maximum antenna current. Plate input power would usually reach a maximum at that combination of settings because of the high load impedance that resulted. Generally, no effort was made to land on a precise frequency, but operation commenced on whatever frequency coincided with the best adjustment.

Fig. 3. Reinartz's Circuit (A) at Top, Mason's (B) at Bottom



Toward the end of 1923, H.F. Mason began the process of teaching amateurs the theory behind correct adjustment of the Hartley system and revealed the cause of the inefficiency of a system adjusted in the usual manner. In 'The Nodal Point Explained' (*QST,* September, 1923), Mason explained the critical importance of the filament tap, which represented circuit 'ground', in the overall system. In an 'out of adjustment' circuit, the filament tap inevitably was not at circuit 'ground' but at some r.f. voltage level which, in turn, drove some of the r.f. current into the a.c. mains via the filament transformer. An efficient adjustment was obtained only when the nodal point of the voltage distribution curve along the antenna, counterpoise, lead-ins and the inductance was exactly at the filament tap as seen in Figure 3B. Moving the filament tap was not a alternative. That would shift the frequency and necessitate resetting grid and plate taps in order to return to the operating frequency and to establish optimum conditions for oscillation. The end result would be the same offset of nodal point and filament tap at a given frequency. Instead, the electrical length of the antenna and C.P. had to be adjusted, either by 'cut and try', or by inserting a series capacitor in either or both leads, or both.

That approach was possible (and necessary) because the antenna, counterpoise capacitance, lead-ins and inductance as in Figure 3B (or antenna, capacitor, inductance, capacitor, counterpoise and lead-ins in Fig 3A, or antenna, lead-in, inductance and capacitor in Smith's circuit on page 38) formed a series tuned circuit. In antenna terms, the system is a very short vertical radiator that is base-loaded by a combination of inductance and capacitance. Such an antenna must be an *electical* quarterwave in length for the voltage node to appear at its base;

for shorter antennas, the base-loading components substitute for the missing length of wire. The nodal point at the filament tap, in other words, is the electrical base of a grounded quarterwave vertical which, however, is not actually connected directly to real ground. Rather, the connection to ground is through the series circuit formed by the lower half of the inductance and the counterpoise capacitance to real ground! For the nodal point to appear at the filament tap, this lower series circuit must be adjusted to produce a halfwave voltage distribution with nodes at real ground and the filament tap electrical ground! This sounds complicated, but there's more. The impedance of the driving source (the oscillator) will be changing with every adjustment of antenna and counterpoise!

Mason pointed out that lengthening the antenna raised the nodal point on the inductance; in effect, that decreased the capacitive reactance presented at the feedpoint (filament tap or electrical base). The same effect could be obtained by forming a circuit consisting of two capacitors in series (antenna and coupling capacitor). Kruse's emphasis upon '*big antennas with series condensers*' applied both methods of electrically lengthening the antenna. When the antenna series capacitor in Figure 3A was correctly adjusted, the nodal point appeared at the filament tap, providing that the other half of the series circuit consisting of the counterpoise and capacitor was also correctly adjusted. The same rationale could be followed in adjusting the C.P. portion. A decrease in the size of the C.P. or raising its height above ground decreased the series capacitance and raised the nodal point on the inductance, and the converse lowered the nodal point.

John Reinartz pushed the approach to its practical limit in fine-tuning the antenna and counterpoise used with the circuit in Figure 3A to produce an ideally symmetrical system. The tap points for antenna, C.P., plate and grid were equidistant from the filament tap for a given frequency and power input, and when changing frequency across the 1.66-2.4 MHz range, identical settings of the ganged coupling capacitors kept the nodal point at the filament tap and equal current readings on the antenna and C.P. r.f. ammeters! Reinartz's system was similar in shape to that seen in Figure 4. However, six-wire cage construction was used in the the system: the horizontal portion consisted of an 18-inch diameter cage 42ft in length, the vertical portion of a 9-inch cage 33ft in length, and the counterpoise of a an 18-inch cage 65ft in length at heights of 12ft at the antenna base and 5ft at the end. During development by the 'cut and try' method, the counterpoise was trimmed six inches at a time and the height was varied until the nodal point remained at the filament tap for settings of the series capacitors and taps across the above frequency range and at various power levels. Broadband operation was one definite advantage of the flat-top and cage approach!

In any event, the necessity of aiming for the ideal represented by Reinartz's achievement was soon eliminated by further development of the Hartley circuit. In 1926, Hagemann found that the frequency instability caused by changes in antenna impedance could be minimized by greatly reducing the size of the inductance and shunting it with a large capacitor, thus forming a parallel tank circuit tuned to resonance largely independent of the antenna system. In K7BWZ's circuit (page 134), the fixed capacitive coupling of the tube to inductance remains, but antenna and counterpoise are loosely coupled to the tank circuit by means of an adjustable 'link' coil instead of series capacitors. But by then, antennas had also changed. '*Fundamental wavelength*' meant a half-wave resonant antenna over ground instead of a very short top-loaded vertical over a counterpoise. Furthermore, non-resonant balanced feedlines had replaced the separate lead-ins from counterpoise and antenna. K7BWZ's circuit is the last that showed a counterpoise as part of the system.

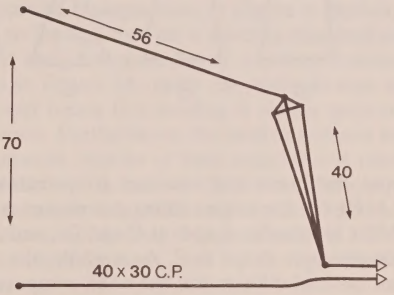
However, before those developments in antennas and the Hartley oscillator occurred, the use of series capacitors was the only method around for adjusting

the Hartley system for maximum efficiency. The method had an inherent problem though. For example, Gunn had noted that, while the use of series capacitors was a perfect solution in theory, the quality of the mica 'condensers' available at the time was poor, so that any increase in efficiency through their use was offset by dialectric loss. This is easily understood in view of the fact that quite large voltages would be developed across the series capacitor in these short antennas. Kruse noted that air- variable capacitors would be ideal in this application, but as yet, *'we have not seen any ads of a .0005 microfarads variable air-capacitor able to stand 5000 volts or better'*, the voltage drop to be expected when the very short antenna was operated at high power. He enigmatically added that *'We know of one, tho'* without explanation; of course, he was referring to the capacitor that *he* was using in his antennas tests!

Kruse reported the results of those tests in the February, 1924, issue (see Chapter 2, pages 35-37) and provided data that sheds light on the shift in complex operating conditions that accompanied the transition from very short antennas to loaded antennas approaching a quarter wavelength positioned over a counterpoise. Kruse's antenna is seen in Figure 4 along with the data which was averaged from a large number of tests. The signal strengths were given as 'good, some QSB' at 1.6 MHz, 'good, no QSB' at 1.8 MHz, 'stronger, no QSB' at 2.3 MHz, and 'very strong' at 2.7 and 3.3 MHz. The peaking of signal strength indicates that maximum efficiency was obtained at 2.7-3.3 MHz. Analysis of the data seen in Figure 4 helps us to understand why *'big antennas with series condensers'* were an improvement over short antennas and high antenna currents.

Fig. 4. Kruse's Antenna System.

Mhz	pF	Amps Input
1.6	0	5.2a 600w
1.8	0	4.8a 600w
2.3	250	2.8 500w
2.7	120	1.5 400w
3.3	50	0.6 350w

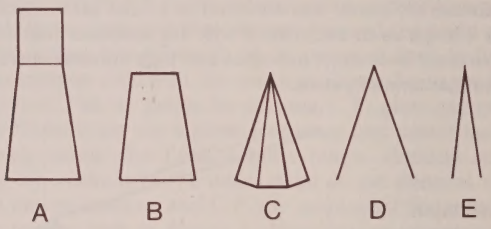


Considered separately, the antenna, with an overall length of 96ft, calculates to a quarterwave at about 2.4 MHz, and lead-in length (not given) would drop that a bit lower. Note that a series capacitance of 250pF (small capacitive reactance) at 2.3 MHz was required and the increase in signal strength began at that point. This would seem to indicate that the antenna had turned inductive (or longer than a quarterwave for the frequency) at that point. If so, the resonant frequency of the antenna should have been a bit lower, perhaps 2.1 Mhz or so. Maximum signal strength, moreover, should have occurred somewhere in that vicinity, but actually occurred higher in frequency, beginning at 2.7 MHz, suggesting that the nodal point vs filament tap condition optimized between 2.7-3.3 MHz. The factor that is not apparent here is the effect of the mutual couplng between the horizontal portion of the antenna and the counterpoise that shunted a parallel capacitance across the oscillator inductance, and the shift in tube load impedance, also shunting the inductance. The overall effect was a rise in the resonant frequency of the system and a broadbanding effect across the above frequency range. This would seem to contradict the logical expectation that adding a

counterpoise would lower the resonant frequency. However, the size and height of the counterpoise were the deciding factors in regard to its effects upon system resonance. The nature of this relationship was clarified in another 1924 article about counterpoises.

In 'A Counterpoise Investigation' (*QST,* December, 1924), Gaston B. Ashe (*6XBN*) showed antenna resistance curves vs counterpoise shapes and sizes that shed light upon Kruse's data Five shapes are shown in Figure 5: A-E are 100ft in length; A-D are 100ft wide, E is 3ft wide at the bottom, and A and B are 40ft wide at the top with two additional wires (not shown) spaced evenly inside the two, but terminated at the internal cross-wire in A. Ashe was only interested in the effect of counterpoise size and shape so he did not give specifics about the antenna. The measurements were made both with and without series capacitors to resonate the system, with no difference in the shape of the resulting antenna resistance curves. It is unclear from his note just what happened to the curves when the series capacitors were inserted, but he seems to indicate that a higher resistance occurred at a slightly lower frequency. Nonetheless, two aspects of Ashe's curves are relevant, namely, the shift in resonant frequency and antenna resistance with variations in the area and shape of the counterpoise.

Fig. 5. The Counterpoises Tested by Ashe.



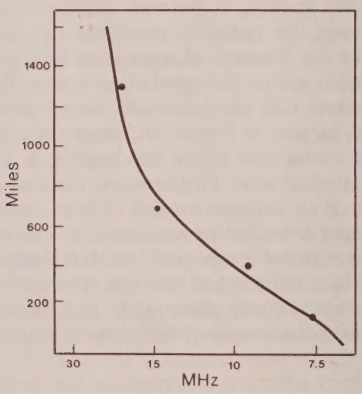
The input resistance and resonant frequencies were: about 16 Ohms from 1.875-1.97 MHz for the large rectangular shapes A and B; 18-20 Ohms between 1.85-1.97 MHz for the fan shapes at C and D ; and 24 Ohms at 1.71-1.87 MHz for the 3ft wide two-wire shape at E. As a whole, the large group A-B-C-D exhibits insignificant internal differences, but when compared with the small counterpoise E, the surprising effect of a decrease in counterpoise area is obvious. The mutual coupling between antenna and counterpoise is similar to that between the two halves of an antenna, each coupled directly to the reflecting ground plane (real ground) beneath according to their length/diameter ratio, electrical length and height. The small C.P., in effect, is a resonant part of the system. It is interesting to note in this context that Mason remarked of his experiments: *'it has been actually found that with a cage counterpoise the nodal point will be very near the center of the system, measured from the end of the antenna along the wires to the end of the counterpoise'*. This implies a half-wave voltage distribution on the system as seen in Figure 3B, with a final quarterwave shift in magnitude and phase across the counterpoise capacitance to ground. In a properly adjusted system with nodal point at the filament tap, the resonant frequency of the system would be close to that calculated by the quarterwave formula for the skywire portion A-B in Figure 1. However, the large area counterpoise represents an entirely different case. Its large distributed capacitance resulting from the small length/diameter ratio renders it a non-resonant part of the system. It was interposed between antenna and ground with the result that the antenna coupled into it instead of

ground, thereby reducing the effective height of the portion of the antenna at B of Figure 1, raising its resonant frequency, and decreasing its input resistance. Kruse's counterpoise exibited these effects of the large area type counterpoise.

The broadbanding effect which we recognise as a result of thickening the antenna and lowering its 'Q' is apparent in the fact that maximum signal strength persisted from 2.7-3.3 Mhz. This phenomena is apparent in other published data where the same pattern appears: as Kruse noted of tests with 8AQO: '*the signals built up until at 176 meters they were truly tremendous*'. In this context, Ashe noted a phenomenon which he did not understand: '*something peculiar happens to the resistance right at the fundamental. It flattens off very suddenly and seems to drop a* bit'. At the time, the role of the reactive component of antenna input resistance was not known, nor was it distinguished in measurements such as Ashe's and Gunn's. They were actualy measuring a complex impedance consisting both of actual radiation resistance and reactance. The latter, as we now know, decreases as the signal approaches the resonant frequency of the antenna system, and, in fact, we define resonant frequency as the point at which the reactance disappears, leaving a pure resistance. Ashe's crude measurement instrument and technique responded to the fact that the reactance changes slowly in the vicinity of the resonant frequency in thick antennas

Finally, the decreases in antenna current and input power shown along with Kruse's antenna can be explained by reference to the nature of antenna current that was being measured. Kruse was correct in debunking high antenna current, but his explanation that the radiation resistance had been raised was only partially correct (see page 36). Indeed, as the very short vertical was loaded so as to approach a quarterwave, the radiation resistance did increase, but not nearly enough to account for the dramatic changes seen in Figure 4. Rather, the high currents are exactly what are to be expected on a severely mismatched antenna due to the standing waves that are developed. An r.f. ammeter inserted directly into the antenna lead, as seen in Figure 3A, reads the *algebraic sum* of incident and reflected current waves, and hence this reading is always greater than the actual current in the incident wave. Furthermore, the load impedance seen by the driving source with such an antenna consists of both resistive and reactive components. As the antenna is loaded to resonance, the reactive component disappears, leaving only the resistive component, which is always less than the complex impedance presented by a mismatched antenna. The end result is a lower antenna standing wave current, a lower plate input, and the stronger radiated signal from an antenna which radiates most of the power fed to it.

Taylor and Hulbert's Skip Distance Curve (see Chapter 2, page 29). The data points were provided by daily tests during the spring of 1925 voyage from New York to Panama. The curve enabled Taylor and Hulbert to calculate the expected electron density required for total refraction of a wave of given frequency, and to hypothesize the *critical angle of incidence* beyond which rays leave the ionosphere. More importantly, they correlated wave frequency, electron density and critical angle of incidence in a radical new concept; *'It also turns out that the critical angle is a function of the frequency and that the higher the frequency, the flatter the angle'*. They took into account earth curvature in predicting a maximum skip distance of 1400 miles with a minimum usable wave angle of about 5 degrees, and correctly hypothesized the role of the earth's magnetic field in the rotational dynamics of ionization around field lines. Likewise, they correctly hypothesized that the ionosphere was a 'complicated upper ionized layer ... full of convolutions and variations' and that fading was largely due to polarization mismatch between incoming signal and antenna. However, the lack of real data led to a few mistaken notions about the height of the 'Heaviside Layer' which they thought was low in summer and high in winter, seasonal variation in absorption rates with rising frequency, and ionization intensity, which they thought was higher in summer than in winter. And, despite their limited knowledge of the ionosphere, they correctly predicted the upper limit for skip propagation: *'we are not likely to see very satisfactory communication over great distances on waves shorter than 10 meters we will say -- that is, of higher frequencies than 30,000 KC'*.



Membership dues for *The QRP Amateur Radio Club International* are currently $11 U.S. ($13 Foreign) for the first year. This includes a lifetime QRP number for use in contests, and four issues of the *QRP Quarterly,* the excellent publication of the QRP ARCI in *QST* format. Check or M.O. to: William K. Harding, K4AHK, 10923 Carters Oak Way, Burke, VA 22015.

Membership dues for *The Michigan QRP Club,* open to QRP'rs worldwide, are currently $7 initially per year which includes membership number and subscription to the excellent newsletter *The Five Watter.* To: Membership Chairperson, 5346 W. Francis Road, Clio, MI 48420.

The Original Circuit of the 'WN3COB Novice Special'. *D.c. high voltage to pin 4 (+) and pin 1, with 6.3v filament voltage to pins 2-7. L2-L3 are designed to feed a balanced load such as a dipole made from 300-Ohm twinlead. Spacing is adjusted for best antenna current as indicated by #49 or #47 bulbs inserted in the feedline. C4 is adjusted for a compromise between highest output and best note. The diameter of L1-L2 is non-critical so long as the inductance resonates on 80 and 40 meters with whatever size of capacitor is used at C4. The construction approach followed in the original article is seen in the accompanying photo.*

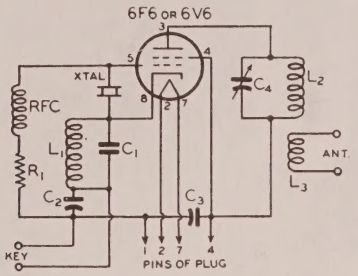
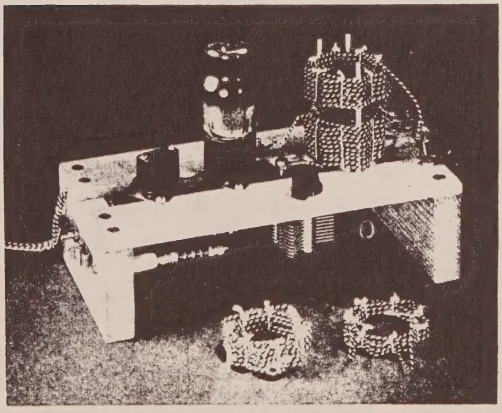
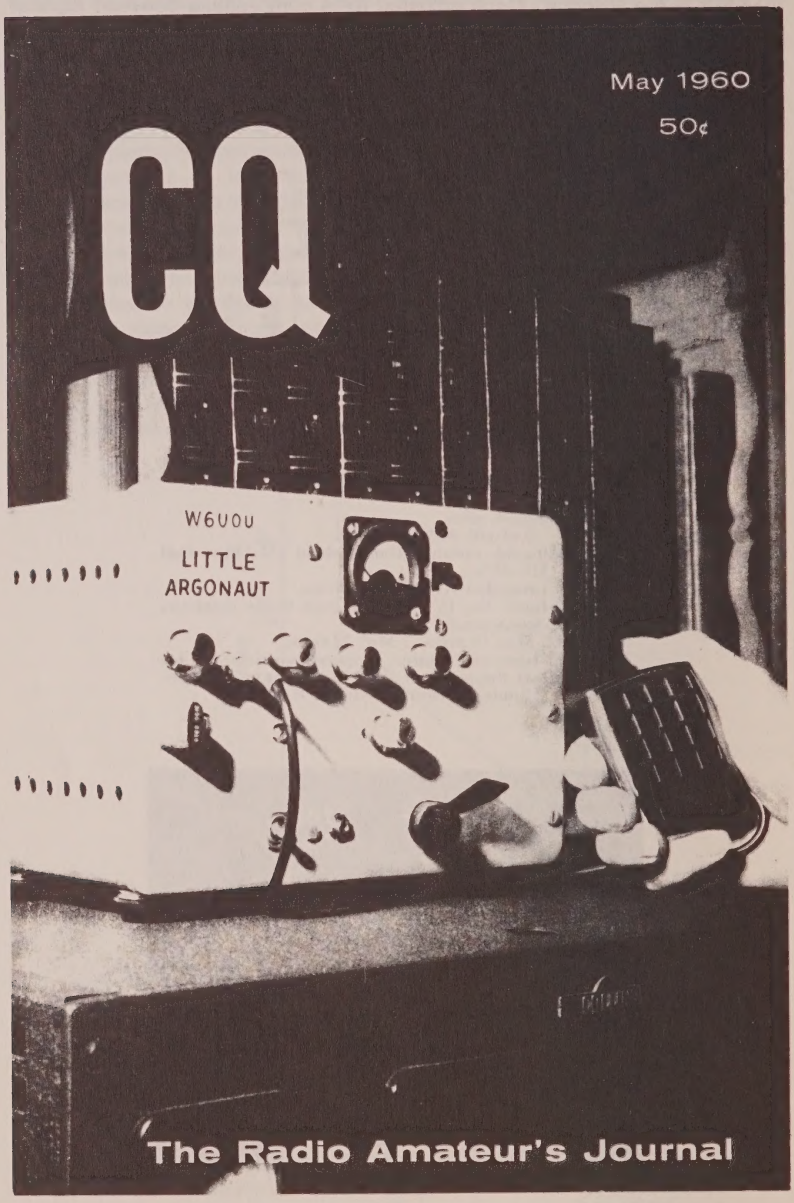


Fig. 1 — Wiring diagram of the inexpensive transmitter.

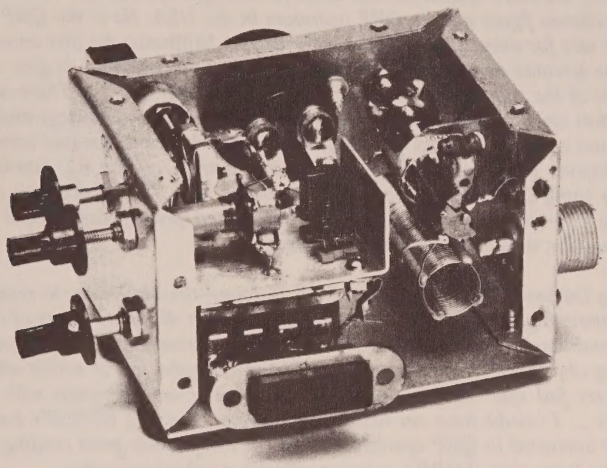
C_1 — 470-$\mu\mu$fd. mica.
C_2, C_3 — 0.01-μfd. 600-volt paper.
C_4 — 140-$\mu\mu$fd. variable (Hammarlund SM-140 or Bud MC-1876).
R_1 — 0.1-megohm 1-watt composition.
L_1 — 5 turns No. 18 d.c.c., 1¼-inch inside diameter, close-wound.
L_2 — 3.5 Mc.: 19 turns. 7 Mc.: 12 turns.
L_3 — 13 turns and 6 turns. Requires experiment — see text. See text for L_2 and L_3 winding instructions.
RFC — 2.5-mh. r.f. choke (National R-100U).

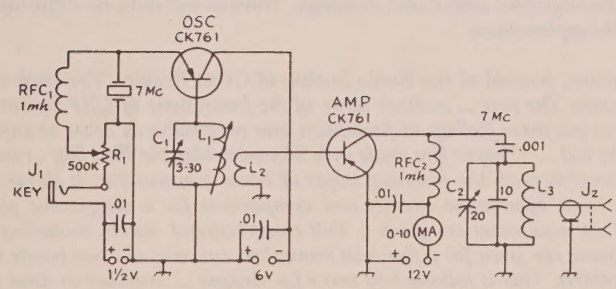


Cover Photo of the S.S.B. Argonaut *(see page 162). The most famous QRP rig of the vacuum tube age, it and the tube were eventually consigned to oblivion by the transistor, but its heritage was resurrected by TenTec Inc. with the introduction in 1972 of an even more famous solid-state Argonaut.*



The First Solid-State QRP Transmitter Featured in *QST (March, 1956). Designed by E. Laird Campbell, W1CUT, the transmitter was the forerunner of a multitude of such rigs now pumping mini-signals into the ether (see page 179).*





The Joy of QRP: Strategy for Success (1985) by W0RSP has become a classic on the subject of QRP and operating the high frequency bands. Excerpts from reviews of the book:

George Dobbs, G3RJV, founder on the G-QRP Club, writing in *Shortwave Magazine*: *'We have waited for this book for along time! Adrian Weiss is perhaps the best-known figure among QRP operators in the USA. He is the QRP Editor of* CQ *and was for many years the publisher of* The Milliwatt, *the first amateur radio magasine devoted to low-power operation ... The book attempts to give an overall treatment of the sujbect of low-power working on the h.f. band ... There is an excellent section on techniques for operating with low power, and strategy and planning for hf band operating ... I am most impressed both with the scope and content of the book. Anyone thinking of trying low-power operation on the h.f. bands, or even currently using QRP, should benefit from reading it ... The sections on objectives, planning operating techniques, band selection and propagation would help any radio amateur, whatever power is being used....*

Doug DeMaw, W1FB, writing in *QST*: *'I found the book easy to read, and the text is interesting throughout ... The operating section discusses times of day versus band conditions, band selection for best results, antennas for QRP and general operating objectives. This is the area of flea-power operation in which which many newcomers fail after having grown used to high-power operation with elaborate antennas ... I would have no hesitation in recommending W0RSP's book to any amateur interested in QRP operating. In fact, it will provide great reading for nearly any active ham, even if QRP is not presently a ham-shack objective.*

Bill Welsh, W6DDB, Novice Editor for *CQ*: *'151 pages covering QRP from basics to fine points in eight interesting chapters. It is interspersed with a total of about 50 photographs, tables, and drawings. Novices will have no difficulty understanding the explanations.*

In *Radcom,* journal of the Radio Society of Great Britain: *'The book contains eight chapters. The first ... outlines some of the frustrations of QRP operating and tells how to put these feelings of frustration into perspective in order to enjoy QRP work to the full ... Chapter five deals with 'Homebrewing the First Rig' ... and takes the newcomer through the planning stages of home construction. It shows how to select the most appropriate circuits and components for a prospective project ... details of test equipment are given ... Full constructional details, including printed circuit layouts, are given for a five watt transmitter covering any two bands between 3.5 and 14MHz. This is followed by two v.f.o. designs ... intended to drive the previously decribed transmitter ... finally a regulated power supply is described which can provide between 1.5 and 15 volts at 3 amps ...* **The Joy of QRP** *is essential reading for anyone who is interested in improving their operating skills on the hf bands. The author has used a thorough and in-depth approach to all the the topics covered in this book, but in doing so he has maintained and easy-going and entertaining style. It would be difficult for anyone to read this book and not gain something useful from it.'*

The Joy of QRP is available from Milliwatt Books, $10.95 U.S., $12.95 Foreign.

About the Author

First licensed as WN3COB in 1955, then K8EEG in 1957 and finally W0RSP in 1977, Adrian Weiss has long been an avid QRP'r. In addition to homebrewing and operating, his interest in QRP led to the founding of **The Milliwatt: National Journal of QRP**, published 1970-1975, and he has served as QRP Editor for **CQ** Magazine since 1974. Solid-state design, propagation and DX'ing, and QSO'ing other QRP'rs are his chief interests in amateur radio. In "real life", he holds a Ph.D. in English Renaissance Literature and derives his greatest professional satisfaction from teaching Shakespeare's dramas.

The Joy of QRP: Strategy for Success by the author is still available from Milliwatt Books (see inside flyleaf for details).

The History of QRP in England by Christopher Page (G4BUE) is underway with a projected publication date in early 1989. The large amount of historical information gathered to date will translate into important and interesting reading. W0RSP and G4BUE remind readers that information about QRP, regardless of country, up to 1960 should be submitted to the authors for future use.

The QRP'rs Guide to Transmission Lines/Antennas, Propagation and DX'ing, a detailed comprehensive examination of the subject of ionospheric propagation and its application to QRP work, with special emphasis upon DX'ing, is scheduled for 1989 publication. Data and insights gained by QRP'rs should be submitted to W0RSP for possible use.

Still available while they last: 10 back issues of **The Milliwatt: National Journal of QRPp** at $10 per packet - a goldmine of QRP material for the 1970-1975 period. Also, HW-8 owners will be interested in reprints of W0RSP's series of classic articles about this popular transceiver, including the test report and two articles detailing modifications such as Receiver Incremental Tuning and the addition of a wattmeter - $7, proceeds to support the *Milliwatt DXCC Trophy Program.*

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